June 1987 £1.00

BURTON

AMSTRAD COMPUTER USER



Hewson conjures up another hit with Ranarama

Starglider: The game that spans the systems

Arnor strikes back with Maxam II

Head over Heels: Pokes and mega map

Win modems from Pace and footballs from CDS

Official Amstrad Home Computing Magazine

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JON RITMAN AND BERNIE DRUMMOND PRESENT DOUBLE TROUBLE...

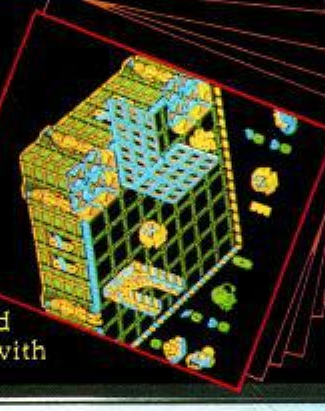


MASTER GAME

"What a tremendous game! The graphics are superbly designed, the characters perfectly animated, the gameplay so addictive you'll never want to switch off. There is plenty of variety and an abundance of humour. Head Over Heels is set to become a classic."

AMTIX! Accolade

"Beautifully-defined characters that glide around the screen without a glitch. Should grace the shelves of every PC owner."



Hi! My name's Mr. Head. Some say I'm the one with the brains but I don't think my flat footed friend would agree. I'm a real sharp shooter, but without my pal Mr. Heels I'd get nowhere fast . . . or slow! I can jump like a flea and even glide but Heels is the Daley Thompson of the two of us – he's FAST! Together, if we can find each other, we really do make an awesome twosome, and that's the only way we can overcome the emperor Blacktooth. The last time we entered Castle Blacktooth we found the crowns of THREE of the supressed Kingdoms but by that time I'd run out of doughnut ammunition and my buddy was lost somewhere in the Safari world – it was the closest we had come to defeating that rapscallion – we were jumping for joy, splitting out sides, dying with laughter . . . we were Head over Heels!

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AMSTRAD COMPUTER USER

The official magazine for all users of Amstrad computers

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New software for the summer

The software industry must be one of the few which hopes for a miserable summer. If the weather is poor then you are more likely to be indoors pounding away on the keyboard. All the big names in software have a packed release schedule:

Gremlin Graphics has released Auf Wiedersehen Monty, the last-ever Monty Mole game, the small rodent now being over the hill.

Next up is the Samuri Trilogy, then we will see a game the editor is eagerly awaiting, The Spring Bounces Back, in which the bouncy binary blob has to turn off the computer within the toy goblin's lair, keeping yourself well oiled and avoiding many spritey perils. It may be out before the summer, perhaps in the spring.

Convoy Raider places you in charge of sea defences, choosing the right weapon, a strategic wargame. Nimrod may sound like a very expensive aeroplane but it is the name of a Biopton, a friendly alien race. Nimrod has been alien-napped by the Cratons, you have to rescue him.

Bounder II and a yet to be named 3D tunnel game with vector graphics conclude the schedule.

Mastertronic appears to be as profligate as ever, Chronos is a good racy, spacey shoot-em-up, to be followed by Strike, Jackie & Wide, Masterchess, Ballcrazy and Galletron.

Ocean has clinched a two-year contract with Spanish software suppliers Dinamic. The first two titles are Army Moves and Game Over. With the exceptional strength of the Amstrad in the Spanish market you can expect some top-notch games, as the screen shots show.

Later in the year we'll see Freddy Hardest, an astral playboy's search for a spaceship, Basket Master, a sports simulation and the morbid sounding After The War.

Follow that Cheetah

A leopard may not change its spots, but Cheetah has moved its lair. The company which brought you the Amdrum and other similarly noisy products is now at Norbury House, Norbury Road, Fairwater, Cardiff CF5 3AS.



Mark pays the price . . .

Caught! A software house which promoted a game before it was ready. They Sold A Million certainly looked finished when *ACU* saw it last year, but only now has it escaped Ariolasoft's Covent Garden confines.

Meanwhile Mark Eastman suffers the punishment which should befall all over-optimistic publishers and programmers.



Mark Strachan (blonde) and Dominic Wheatley (brunette) celebrate the launch of Trivial Pursuit – Baby Boomer Edition by returning to Flower Power: "It's great man!"

Larger than life

Major "Wild Bill" Stealy, co-founder of MicroProse, paid a flying visit to London checking up on the limey operation. He seemed pleased with what he found here, but was more than a trifle irked at the Germans who have banned F-15 Strike Eagle and Silent Service as being unnecessarily violent.

The good Major also brought news of two new programs: Pirates, an Elizabethen sailing simulation, and an unnamed, still secret game which ACU assumes to be a flight simulator based on the F-19 stealth fighter, the plane the Pentagon denies exists.

In a larger-than-life speech Wild Bill complained at the lack of interest in simulations and threatened to "load up the wings" of his new warplane and "visit" the software houses of California. I can hear the howls from Electronic Arts and Activision now.



MicroProse president Bill Stealey



Spot the ball

Football does funny things to people, it's either that or staring at a screen playing Football '87. Nick Alexander and his programming friends have clearly lost a ball.



The soft sell

This trio giving Barbarian from Palace Software a rousing send-off are the designer Steve Brown, Starbird of 1986 Maria Whittaker and beefy Michael Vanwrigk – not necessarily in that order.

Obituary



The Viewfax database on Prestel has unfortunately passed away.

This was the first area to deal with microcomputing and claimed a number of exclusives. The Amsnet area within Viewfax will be sorely missed by the staff at Amstrad, *Amstrad Computer User* and by Amstrad-owning Prestel subscribers eveywhere.

The reason for this termination was lack of manpower and funds with which to run the service. Many of the features seem likely to migrate elsewhere.

We wish all the staff at Viewfax, who will be concentrating on non-Prestel activities, well.



THANATOS

In this magical game you take control of a dragon, Thanatos the destroyer, whose eternal destiny lies in conflict with the forces of the underworld. The dragon which is very large and superbly animated, flies, walks, swims, and burns its way through the landscape. The game features fantastic landscapes with a totally new panoramic scrolling action.

"Wow! This game is really amazing; stunning, astounding, brilliant! The tune on the title screen is very nice, but the graphics are absolutely superb." CRASH, December 1986 (overall rating 93%)

£9.95 Spectrum cassette
£9.95 Amstrad cassette, £11.95 Amstrad disk (£9.95 by mail order)
£7.95 Commodore 64 cassette, £9.95 Commodore 64 disk





DEEP STRIKE

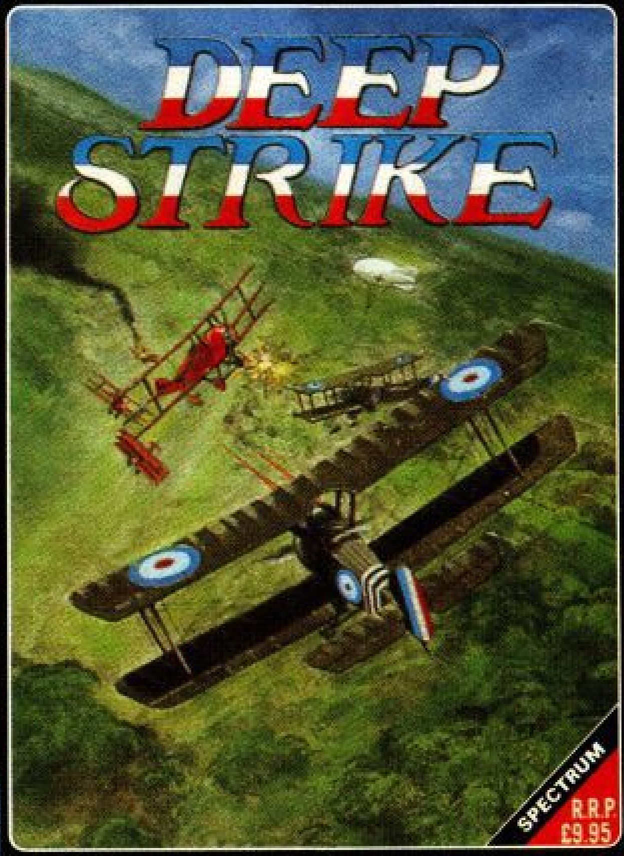
At last an opportunity to try your luck against the Red Baron and his flying circus of World War I flying aces. This game not only lets you take-off in a fully armed fighter, but also gives you control of the four bombers of your DEEP STRIKE attack force. It uses the latest techniques to bring you a smooth-scrolling and tilting 3D landscape viewed from the cockpit in full colour.

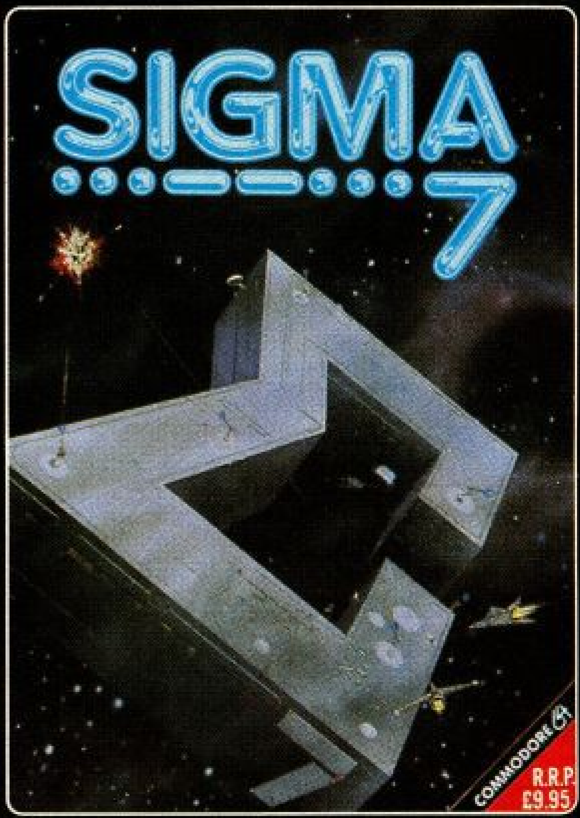
"...after a few games I really got into it. The way you can bomb the ground features (especially churches) makes the game much more enjoyable than if you just had to shoot planes!Overall a game that you should come back to quite a lot in the future." AMTIX, February 1987 (overall rating 71%)

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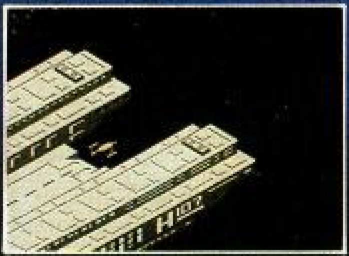
SIGMA SEVEN

An all-action arcade game featuring imaginative state-of-the-art 3D graphics and exciting synthesised sound. There are seven increasingly more difficult stages to the game which starts-out easy but ends-up almost impossible. Each stage is split into three phases : first take a space-fighter and blast your way to the next station through swarm-mine defences, then free that station's internal pathways of killer-robots and radioactive deposits, to finally reach the remote-controlled main panel which must be reset within a critical few seconds.

"I really like this – it has three neat mini-games all of which are very playable and addictiveThe graphics are really crisp and clear with a beautiful starry backdrop..." ZZAPP, February 1987 (overall rating 70%)

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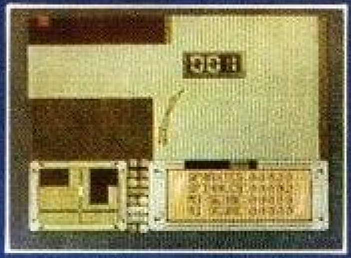
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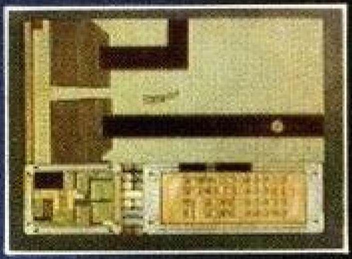
FAT WORM BLOWS A SPARKY

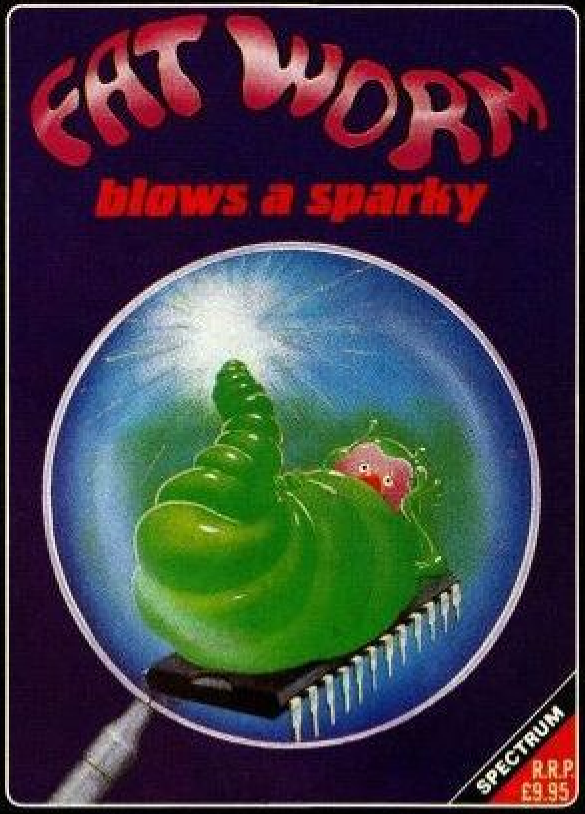
Now for something completely different. You are an insidious little wormie being chased through a Sinclair Spectrum by creepers in sputniks and crawlers on feets. Defend yourself by shooting burper sparkies at the crawlers, and blaster sparkies to take-out the sputniks. You'll see the computer board in a smooth-scrolling 3D viewed from above, as you crawl around in search of a disk drive on which to clone yourself.

"Playability and addictiveness are of the highest standard, but as for the graphics – well, what can I say? As far as animation and solid 3D goes, this is probably the best I have ever seen" CRASH, November 1986 (overall rating 95%)

£9.95 Spectrum cassette only









SABOTEUR II – Avenging Angel

A follow-up by the original author, where as the Ninja's beautiful sister, your mission is to revenge your fatally wounded brother. The rebels have found that the disk he stole in "SABOTEUR" also contains data for one of the dictator's missile silos. Your job is to fly in by hang-glider, fight your way through the security guards, pumas, dogs and radio-controlled robots, to seek out some top secret punched tape to activate the missile's launch control. Launch it, disable the electric perimeter fence, then break-out by motor-bike. Over five hundred locations, three buildings, underground caverns, intelligent guard dogs and stupid guards.

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"All of these megagames charted, all of 'em are winners. If you've spent the last eighteen months begging, borrowing and swopping trying to get hold of these titles, now you can relax|Only Beethoven's Quartets beat this fun foursome – Gimme! Gimme! Gimme! YOUR SINCLAIR, December 1986 (overall rating 9 out 10)

"Unlike most compilations where one title carries the others, the BIG 4 are actually four big games...A collection worth collecting." C & VG, December 1987

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MAIL ORDER

All Durell games are also available by mail order, with no charge for postage or packing. Just include a postal order or cheque made payable to "Durell Software Ltd", along with your name and address, your computer, and the title of the game you wish to purchase. Your game will be sent by return-of-post. **Note: Amstrad disks** are only £9.95 by mail order!

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Choose from three different type styles (plus your machine type) for titles, legend and annotation copy. Deploy different line styles, line and bar widths and eight filled patterns to add clarity and emphasis. Add borders, colours and labels. Bar charts can be stacked, clustered, or arranged in steps or "sticks." Pie charts can include exploded "slices."

Annotation can be incorporated, modified, and moved anywhere you want. Different graph types can be combined within one chart, and as many as four different charts or graphs can be combined on a single page.

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Easy-to-follow menus let you select pre-programmed shapes – circles, bars, arcs, rectangles, polygons, and lines – or create your own pictures by modifying these shapes via mouse or keyboard. Add text anywhere you wish, selecting between a wide variety of type font styles.

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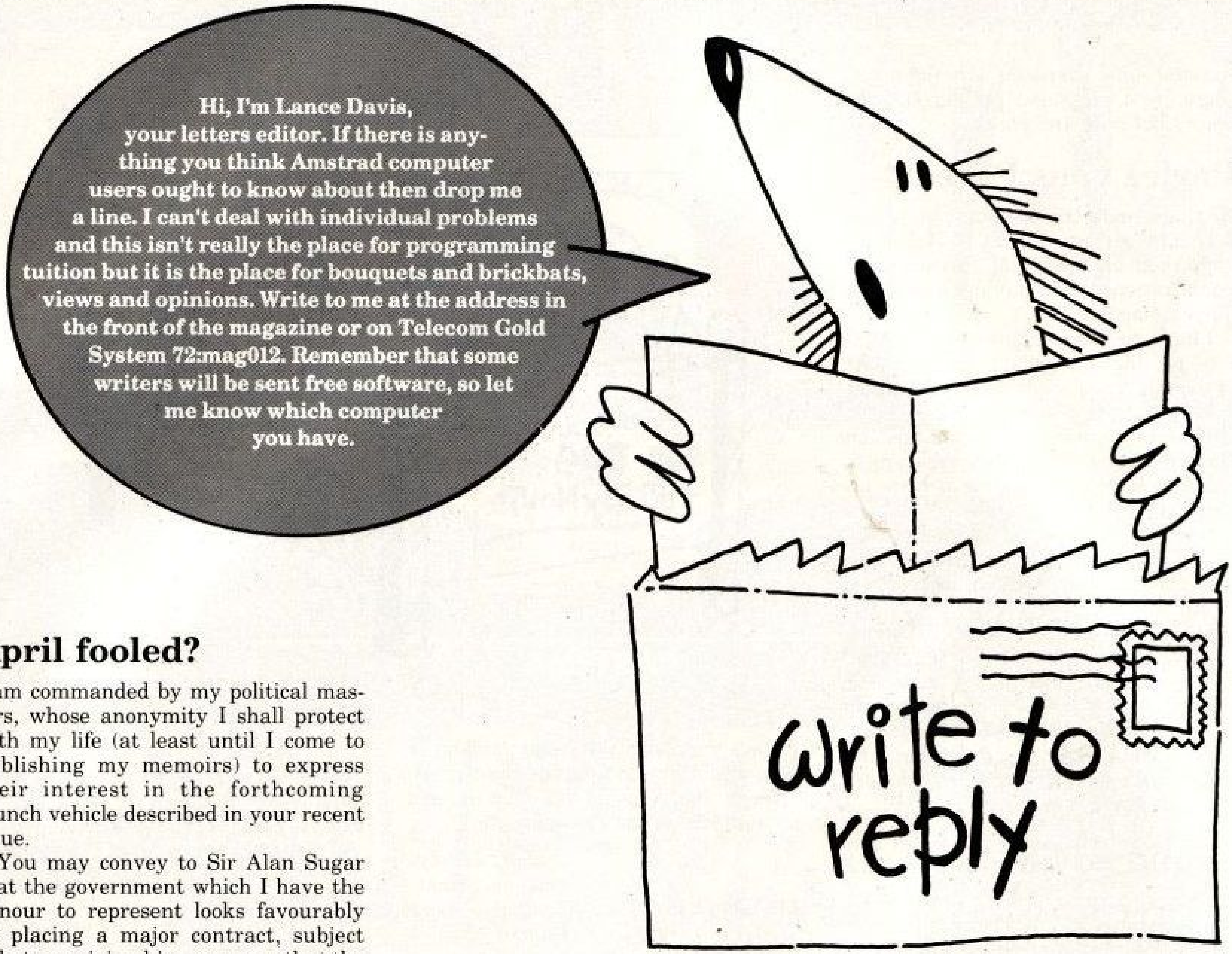
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April fooled?

I am commanded by my political masters, whose anonymity I shall protect with my life (at least until I come to publishing my memoirs) to express their interest in the forthcoming launch vehicle described in your recent issue.

You may convey to Sir Alan Sugar that the government which I have the honour to represent looks favourably on placing a major contract, subject only to receiving his assurance that the machine is ICBM-compatible.

I have the honour to be, Your obedient servant,

Barry Woodford
Weedon, Surrey.

***LD** Great letter, even earnest ed broke into a grin.*

Out in the cold?

Last November we bought an Amstrad computing system from Dixons of Exeter, which consisted of a CPC 6128, CTM644 and DMP2000. This was principally for business use, but we chose this model so that the children could have some educational games type usage.

As we were completely new to computers we expected, and did get, a few initial teething troubles. Our suppliers were most helpful assisting us with problems directly caused by the user's handbook being most unspecific.

As part of our free software package we were supplied with an Amsoft Easi-Amsword word processing tape, with which we had a few problems.

Reassured by the advert in the introduction of the user's handbook, we obtained the telephone number of the customer relations department in Brentwood and to our dismay we dialled over 20 times in the course of a week to no avail – the phone rang but nobody answered.

Are we the only people who have ever tried to take advantage of this advertised helpline? Have other people ever been able to get an answer to their enquiries? What further measures do we have to take to grind an answer out of Amstrad?

How on earth can a company the size of Amstrad get away with offering a customer relations department that does not appear to exist?

We are absolutely disgusted with the lack of treatment we have received, and if we knew that this would be the case when we were in the market for a computer system we should certainly have gone for another make.

A.J. Baker,
Devon.

***LD:** I don't like to appear to rush to Amstrad's defence, but I do think you are being unnecessarily hostile. Amstrad Customer Services is a large department and they do answer the phones, but they are on a queuing system. The phone will ring until someone is available – the old switchboard system meant that you had to pay while you waited.*

The free software offer only applies to the CPC 464, so you should not have been given a copy of Easi-Amsword with a 6128. If you want to use the system for serious word processing I would suggest a more advanced package such as Tasword or Protext.

I doubt that you would have been more successful with another make of computer.

Tape torment

I sympathise with "Distressed" of Somerset in the April edition of *ACU*. For over a year now my old Arnold has not been loading properly. Especially, he does not like "flashload" programs, but to load anything at all is a miracle in itself.

I have had Arnold placed in two separate computer hospitals as a private patient but both returned him saying that he was 100 per cent fit.

However, I don't believe them as all my programs from Fist to Gauntlet won't load. What can I do now?

Desperate, Hounslow.

***LD:** Dr Davis says the computer hospital claims that the cassette deck is in fine fettle then you probably have an alignment ailment. You can realign the*

cassette with a special tape of which there are a couple on the market. Try your local computer shop.

Parlez vous Pascal?

Having caught the computer bug since I bought my son a CPC 464 I have embarked on obtaining further GCE qualifications after having left school 30 years ago.

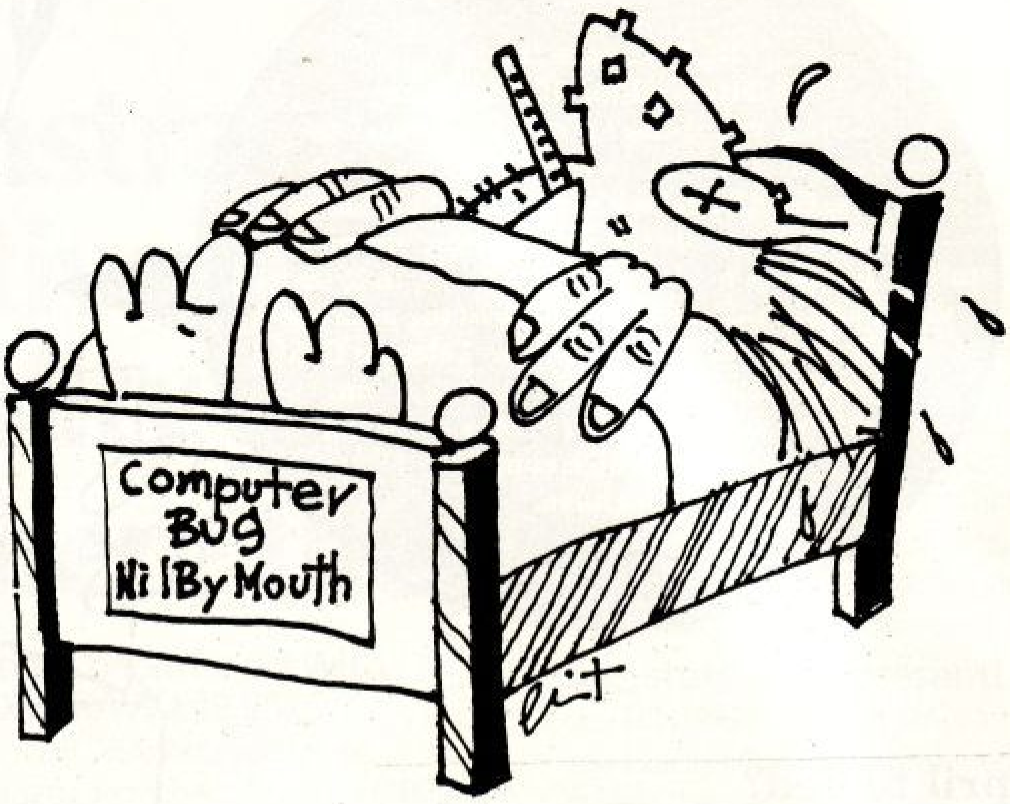
I have passed computer studies at O level writing a program in Basic as part of the test for which my son's computer was ideal.

However, having now embarked on GCE A I am faced with a program in Pascal which I am finding a little bit more difficult to assimilate.

It would be helpful if you would suggest a Pascal compiler for the CPC 464. The computer at night school uses a Prime system.

K.Davitt,
Blackpool.

***LD:** A Pascal compiler is available from Hi Soft, it is sold by the User Club who are on 091 567 3395. A CP/M version, which requires discs, can be obtained directly from Hi Soft who are on 0525 718181.*



Sound advice

I'm writing to pass on some tips to other readers with a DK'Tronics Speech thingi but they may work with other speech devices.

- Set it up as normal but do not plug in the speakers. Now get a set of earphones and plug them in one of the speaker sockets and you will find that all sounds come out of the earphones.
- You can put a set of earphones in both sockets, so there's no need to lower the sound when the TV is on.
- If you have one of those personal stereos where you have to wear the earphones, try plugging in one of the speakers.

I have a 464 with disc drive.

David Donnelly,
Birmingham.

***LD:** Thanks for the tips. I've sent you a copy of the truly wonderful Dynamite Dan II as a reward.*

Going SCARTy

I bought a CPC 6128 with the composite video modulator but after playing some games feel that the resolution of the pictures is not being fully appreciated.

On reading the manual for my television I have discovered that there is an RGB input at the back of the tele – in the form of a 21 pin scart socket.

I have read through my manual for the 6128 to discover how the monitor socket is configured and am puzzled by the use of pins 4 and 6 and how to connect them to my TV. I know several friends who have the same problem or who would like to upgrade their green screens. Please could you help us, and anyone else in the same situation.

S.A. Jeffery,
Sheppey, Kent.

***LD:** Don't worry about pin 6, it isn't used. Pin 1 is for the red signal, connect that to scart pin 15. Pin 2, the green, goes to 11 on the scart. Pin 3, blue, to pin 7, pin 4 is the sync pulse and should be connected to pin 20 of the scart connector with the earth, pin 5 connected to pin 21.*

Remember that a TTL signal will only give eight colours, while a linear monitor will provide all 27.



Great guns

I own an Amstrad CPC 464 and I bought Top Gun immediately after you reviewed it. I had virtually completed it when you gave tips for it with the review.

The review was the best I had ever read or seen. Your colour pictures look really lifelike and now I will give my marks out of ten for the articles in the magazine. Reviews 10, Letters 10, Hairy Hacker 9, Gallup Chart 10, Adventures 8, A great magazine, please don't change anything, except print this letter.

Jonathan Cale,
Exeter.

***LD:** Here are your marks for your letter. Creeping to the editor 10, creeping to the Hairy Hacker 9. I would have sent you a free game but A the letter was too creepy and B you didn't give a full address.*

Desktop publisher

I would like to know where I can get a newsroom program for the Amstrad like they have for the Commodore (Newsroom) or the BBC (Fleet Street).

I spend a lot of time up at the local primary school and we have put together a community newsletter for our town and I would find it a lot easier to do most of the work at home if I could get hold of a program on similar lines.

I have not seen any program advertised in *ACU* and as we live out in the country I do not have easy access to any sizeable range of software.

Sandra Matthews,
Victoria, Australia.

***LD:** The page make-up battle continues. Advanced Memory Systems has Pagemaker which is available but suffers from quite a few bugs, and Mirrorsoft will one day have Fleet Street Editor.*

Keep pestering the dealer who has BBC Fleet Street. By the time this reply reaches Australia it should be available.

ACU

GALLUP SOFTWARE CHART

Pos	Move	Title / Publisher / Price	Comment	Last month	Market strength
1	New entry	**Big 4** *Durrell* £9.95	Topnotch compilation two excellent games, one good game and a totally new program. With this kind of value it is no surprise that Big 4 is at the big number 1 position.	ne	100
2	Up	**Feud** *Bulldog* £1.99	First game on Mastertronic's new label. Chunky sprites and a mystic plot go to make up this 2D arcade game.	5	89
3	Down	**Ninja** *Mastertronic* £1.99	The fist fiends fight on. This time with a more vicious trait and at a lower price. You have to fight off the hordes using a variety of weapons.	1	81
4	Down	**Konami's Coin Op Hits** *Imagine* £9.95	Take the best from the arcades into your home. Green Beret, Ping Pong, Hypersports, Mikie and the splendid Yie Ar Kung Fu. Looking a shade dated now but a good blast all the same.	2	70
5	Down	**Gauntlet** *US Gold* £9.99	The only reason for this falling in the charts is that everyone has got a copy. If you haven't then your software library is incomplete. Go and buy Gauntlet.	3	64
6	New entry	**BMX Simulator** *Code Masters* £1.99	Cycling simulator best played with a friend, a good, fun game with a low price but not the best buy around . . .	ne	61
7	New entry	**Escape from Singes Castle** *Software Projects* £8.95	More Dragons Lair antics for Dirk The Daring. Excellent sprite animation and very difficult to play. Buy the precursor first.	ne	52
8	Up	**Ghost Hunters** *Code Masters* £1.99	A good budget game but suffers from the Chinese meal effect, three hours after playing one budget you want to play another one. Cashes in on Activision's name.	9	52
9	Up	**Short Circuit** *Ocean* £8.95	Let number five come alive on your Arnold. A pretty 3D maze game with a mission to seek out and be cute. Based on the film of the same name.	16	52
10	Down	**180** *Mastertronic* £1.99	Digital darts, you can't use the excuse that you need to steady your hand when you practice this non-intoxicating bar-room skill.	4	50
11	Up	**Riding the Rapids** *Players* £1.99	Aquatic sports simulation for joystick waggers. Avoid the rocks and whirlpools in your incarnation of mediocre mode 0 graphics.	18	48
12	Down	**Mini Office II** *Database* £14.95	Longstanding chart runner. A full suite of business programs for the price of a game. Ideal first look at sensible software but lacks the power for major applications.	10	45
13	Down	**Five-a-Side Soccer** *Mastertronic* £1.99	Football games have been around since the days of pong. Now a cheapie for the CPC keeps the trend alive.	7	43
14	Down	**Computer Hits 10 Volume 3** *Beau Jolly* £9.95	All your fave raves on one tape. A compilation from the various artists of the computer industry. Under threat from Virgin's Now Games 4.	6	42
15	New entry	**Grand Prix Simulator** *Code Masters* £1.99	Super Sprint by any other name would still play as sweet. This is THE bargain of the month. Software speech and a good tune gild the lily. If this doesn't make number 1 something is wrong with the world.	ne	40
16	New entry	**Bomb Jack 2** *Elite* £8.95	The arcade hit improved with more strategy. Excellent special effects using colour switching, particularly good on green screen. Backdrops can get confusing.	ne	37
17	Down	**Five Star Games** *Beau Jolly* £9.95	Another compilation which is doing an admirable job of hanging on in the chart. Spindizzy makes this a classic compilation.	8	35
18	New entry	**Nemesis** *Konami* £8.95	Really exciting space shoot-'em-up. The options to increase your firepower makes this more than just another defender clone. Very difficult but worth working at to see some spectacular sheets.	ne	35
19	Down	**Hit Pack** *Elite* £9.95	Compilation number 5 in this top 20. How long before we see the compilation compilation, or even the budget compilation? A software potpourri would make good use of a disc.	10	34
20	New entry	**Curse of Sherwood** *Mastertronic* £1.99	Confirming the position of Mastertronic as Britain's best selling software house the man in Lincoln Green (there are plenty of greens on a CPC) brings up the rear.	ne	30

Non-mover · Up · Down · New entry

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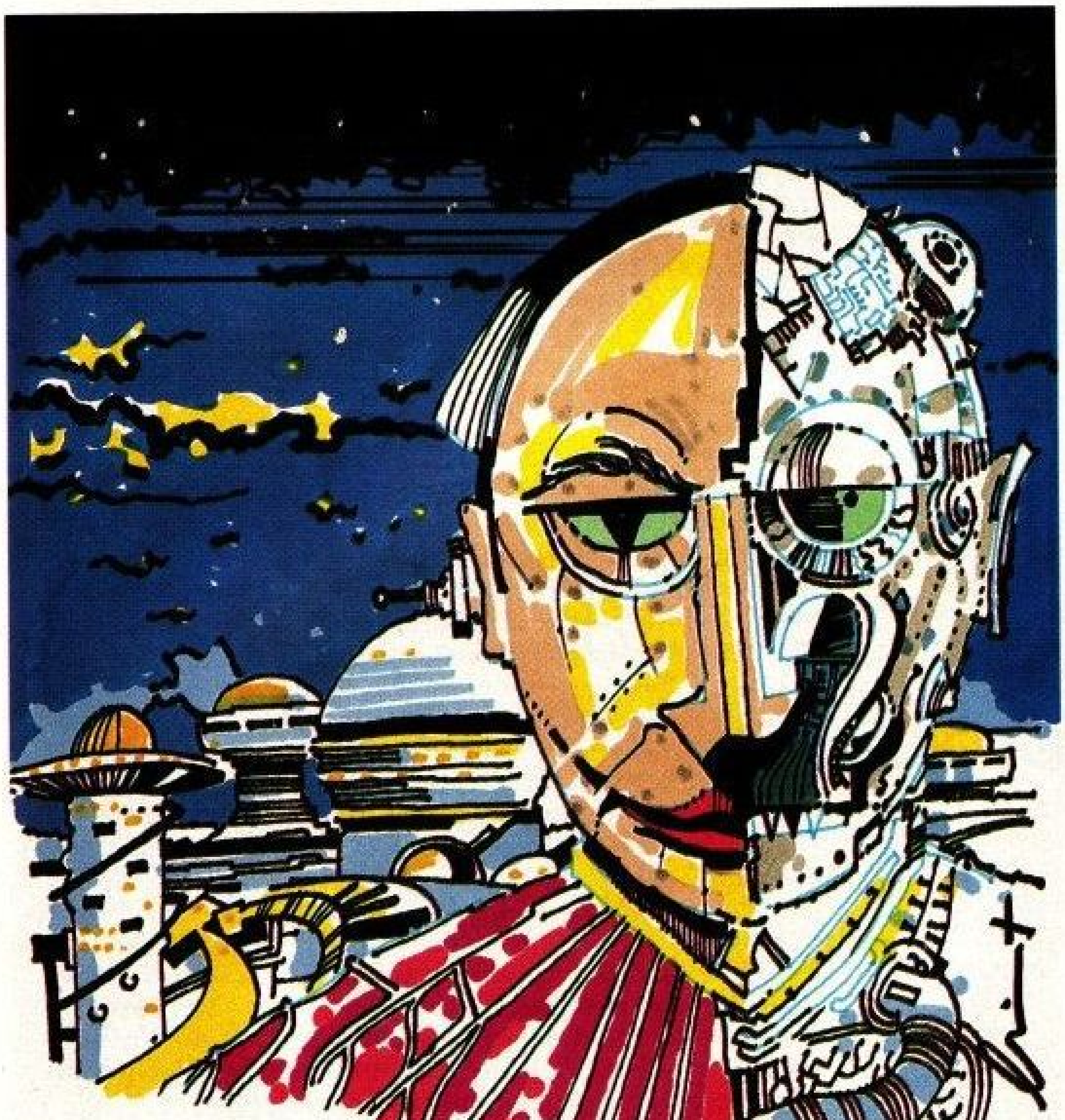
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Seek and ye shall find..

Into adventures with Bill Brock

Necris Dome, on cassette for CPC machine from Code Masters, is yet another of the cheaper adventure games appearing on the market. The story line takes us into the far future where Earth has finally banned the use of all weapons but has not solved that age old problem – death.

With more and more people inhabiting the world, there are an increasing number of bodies to dispose of. For some reason hidden from us, it is now common practice to ship most of these cadavers up to Necris Dome, a giant satellite circling the Earth.

This disposal service is run by a number of intelligent robots called mandroids, their leader being the Arch-mandroid. Over the years he (her, it?) has gradually become more aware of the meaning of the word power.

The time is fast approaching when the Arch-mandroid will demand total subjugation from the inhabitants of Earth or unleash a hail of missiles from Necris Dome.

Your mission, as member of Earth's Secret Service, is to board the satellite and destroy the Arch-mandroid and all that you find there. The only way to get there is, not surprisingly, in a coffin. Once there the rest is up to you.

The idea is novel, and there are quite a few locations to map and explore. The number of puzzles is limited and the location descriptions and graphics are simplistic and repetitive.

The dome is divided up into a number of levels, India level, Soviet level, Americas level and so on.

You need a series of coloured Trans-rods that enable you to teleport between levels. The mandroids you meet have these rods, but you will have to kill them first. Usually the means to end their existence is close at hand and is generally pretty obvious.

Mapping is very important, as is SEARCHing each room. Most rooms on each level are just described by their number and it took me a while to realise that LOOK or EXAMINE did not reveal everything that might be visible.

Although the game is cheap and provides a degree of fun in solving, it does not provide any lasting challenge, has a limited vocabulary and a simplistic parser.

It also has a few strange anomalies. Only one man-

droid may be killed with a given method, even when you have the means to repeat the process elsewhere and if you come across a number of lockers – count how many YOU can open.



The golden west?

Last month I looked quite favourably at Winter Wonderland from Incentive Software. This month I got caught up on the first of their Medallion series of adventures for Amstrad CPCs – Apache Gold. This has you playing a rather dozy cowboy by the unenviable name of Luke Warm. He dreams of finding the legendary hoard of Indian gold the Apaches are said to have buried in their secret burial ground.

You begin in Luke's covered wagon and may wonder just how to get things moving. If in doubt examine everything in sight and you should get the right ideas. Once old Dobbin has got under way there is nothing much you can do until you have been captured by the Indians. Once you have escaped you are on the path to future prosperity.

There are not that many locations but you will find yourself retracing your steps fairly often. The puzzles mainly revolve around getting an item from one location taking it to another to enable you to get something needed at the original location.

There are quite a few objects to be found and every one has some part to play in solving the adventure. The vocabulary is not that large and there are a few commands that I found frustrating. It was obvious what I had to do, but I could not get the program to understand me. The lack of any response indicating what might be wrong only aggravated the situation.

Most commands may be shortened to the first three letters but one verb – THROW – needs special care. On one occasion THR will work, on others you will need THRO or THROW.

The puzzles are on the whole fairly logical, and plenty of clues are to be found if you read the text carefully and also if you keep your eyes open and get into the habit of examining everything.

The graphics are drawn quite quickly, but as you often have to retrace your steps you may find it useful to turn them off with WORDS. PICTURES will turn them back on.

For all the frustration, I found Apache Gold quite addictive, probably because I thought I knew I was on the right track and only had to get the program to get over its dyslexia.

This game should not tax the expert, and should prove enjoyable for beginners who are prepared to play with words.

New horizons

The explosion of sales of the Amstrad PC 1512 will have many far reaching effects. There were of course a number of IBM compatible machines available before the birth of the PC 1512, but the price of the Amstrad and the proven track record of the company in the field of home computers, has tempted many people into joining the ranks of what is one of THE accepted industry standard systems.

Most of these newcomers will be using the machine for business or pseudo business operations. Software for word-processing, accounts, databases and many other related programs is now appearing at a price to match this inexpensive computer. The outcome must be even higher sales of PC 1512s. Many of these users are then going to find that there are additional advantages to be found. Computers do not only mean work, they offer relaxation too!

Although all sorts of games are available in the IBM format, I think that those that will appeal most to the 1512 user will be games that use the brain rather than dexterity and also those that do not necessarily commit the player to hours of play at one time. Not surprisingly, I would put adventure/strategy games at the top of the list!

The Amstrad CPC computers have been well served in this field, with adventures both from this Country and from Europe. Sadly some excellent games from America have not been converted for the CPCs (or PCWs). Conversions for Atari, Apple, Commodore or IBM computers are the norm, as these sell well on the other side of the big water. The PC 1512 now opens up a completely new dimension for the adventure buff. Taking note of 1512 sales and the potential for American sales, software houses are already looking for PC conversions of their best adventures. With the already existing large base of American adventures, the 1512 user could well have the best of both worlds.

Here be dragons . . .

One such import from America is Dragonworld by Telarium, based on the novel of the same name by Byron Preiss and Michael Reaves. Telarium are fairly well known on the USA adventure scene with all their games so far, based on books by well known authors. They usually consist of two discs, have reasonable graphics and a good quantity of well written text.

In Dragonworld you are Amsel of Fandora, a scientist and researcher, leading a solitary life away from the rough and tumble of the sprawling medieval cities found across the lands. In the not so distant past you were responsible for averting a bloody war between Fandora and its neighbour Simbala.

In that adventure you met and became firm friends with Hawkwind of Simbala and the almost legendary figure of the Last Dragon.

On parting, the latter gave you one of the precious Dragonpearls, a mystic creation that permits visions of the past and predicts the future. Through this, you have learnt that the Last Dragon has been captured by the Duke of Darkness. There is no ignoring the call, you must find

Hawkwind and together you must rescue your friend.

First you must travel to Simbala from your island retreat, and enlist the help of Hawkwind. Then travel to the city of Kandesh and beyond to Dragonmount for the final stages of your quest. There are a number of good puzzles, and if you get stuck there are a series of simply coded hints at the back of the instruction booklet.

Initially I thought that the game was of that type of bookware that requires little imagination on the part of the player, with all your moves planned carefully in advance by the programmers.

True, in the first few stages there is really nowhere to go except along a predestined (programmed) path in the right direction, but do not get overconfident – there is more to come.

Commands are generally given in the form of verb/noun but more complex inputs are occasionally called for and different commands may be linked with THEN to form one sentence.

As you travel, talk to all the characters you meet, you never know what you may learn. Take care in drawing your maps, the layout is fairly logical, but the distance travelled in one move, does not always correspond to the distance travelled in another.

Amsel is neither very tall nor particularly strong, so when you find an action is beyond you, try ASK HAWKWIND. He is a very obliging chap and incredibly useful to have around on a trip such as this.

The instruction booklet provides a list of well over 500 words that the program understands. Type in NEWDATA when you first start the adventure and you may well learn a few more. This is not to say that they are the only ones understood, but you certainly should not be at a loss for words in this game.

You will need a separate formatted disc on which to save your game positions. Once you start the adventure type in CREATE and follow the on-screen instructions. This allows you to have 10 saved positions, each with a label to remind you later what it was you saved.

When you first open up the packet you will probably read the instructions for "Loading on the IBM". These could give you a slight problem. They explain how to install part of the dos (disc operating system) on to the Dragonworld A disc. This would then enable you to start the game by just inserting the game disc when you switched on your 1512. Unfortunately there is not enough room on the disc.

How then do you start playing? Switch on and insert the Amstrad red disc and wait until you get the A> prompt. Remove the red disc and put in the Dragonworld A disc. Type AUTOEXEC.BAT, press Return, and away you go.

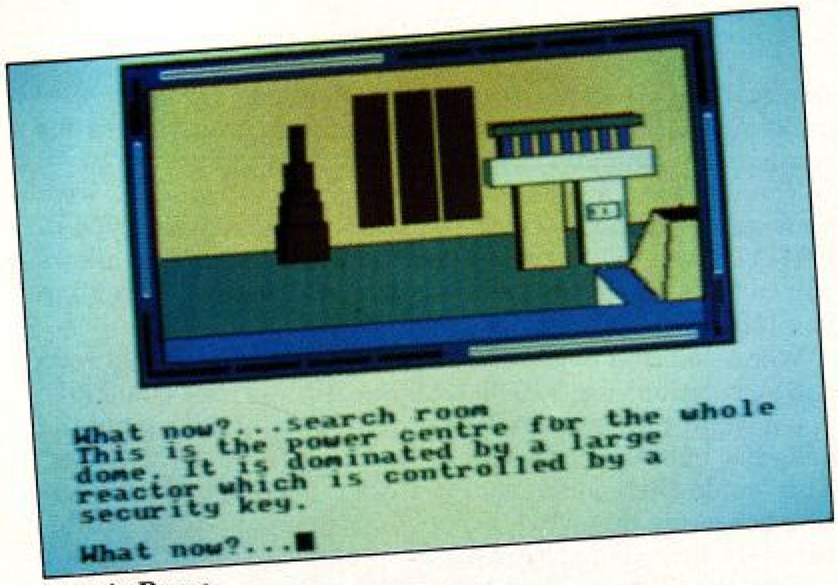
Shareware

Whilst on the subject of adventures on the PC 1512, do not forget that a host of cheap programs are available either as public domain software or through the many user groups.

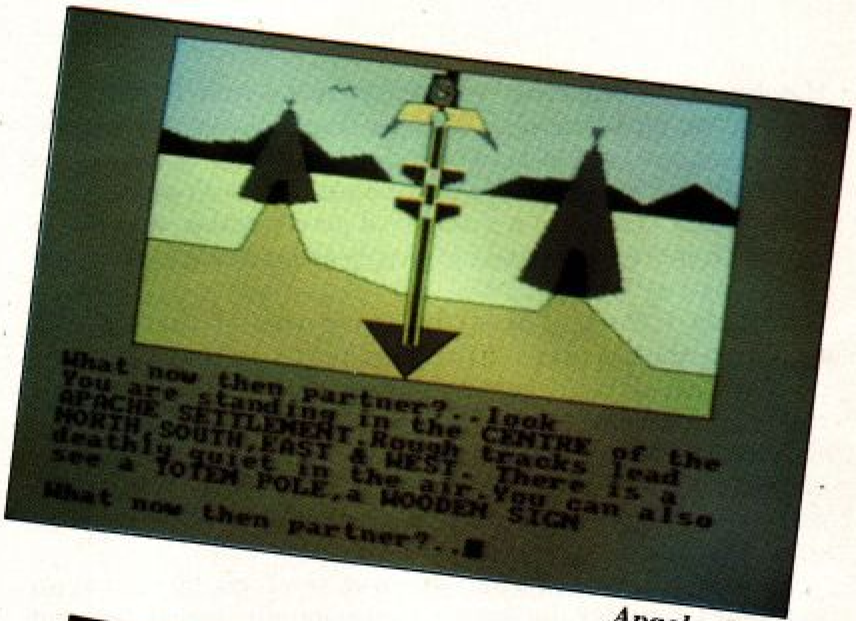
There is still some uncertainty on how much you should pay for these programs. Most come from the USA and have a README file that suggests you send the author a nominal fee.

You may have to pay a member's fee followed by

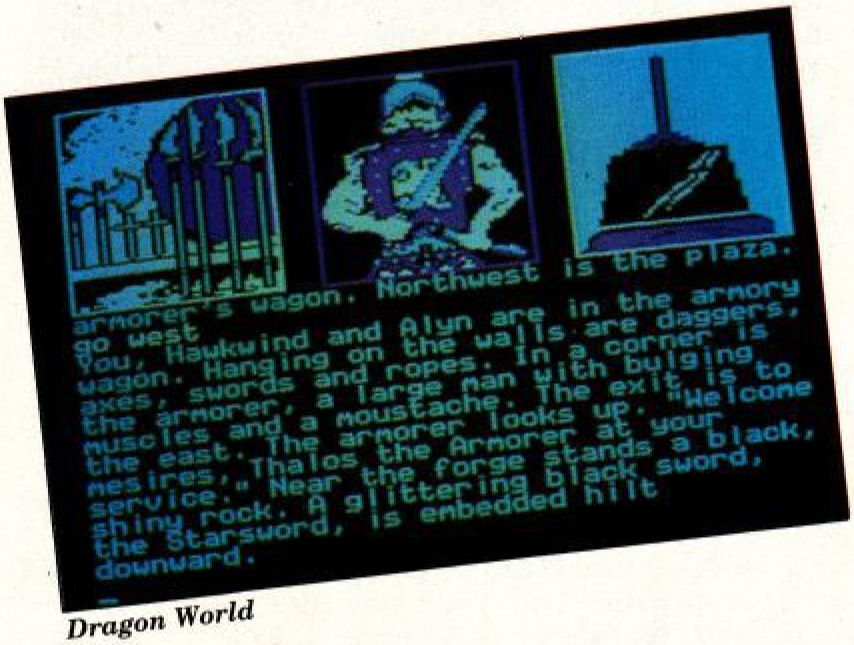




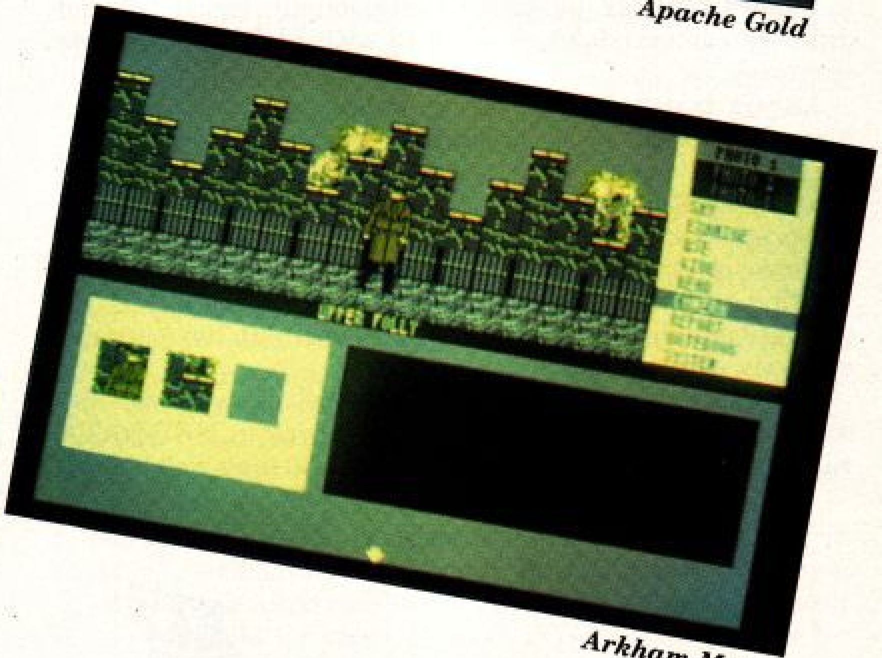
Necris Dome



Apache Gold



Dragon World



Arkham Manor

something for each disc. Membership fees vary from around £7.50 to £35 and disc prices from £3 to £10.

The idea of this form of software distribution was to create a large range of cheap programs and not commercial profit. Some very good programs are available in this way, but do be careful that you are not paying more than you should – and remember the original author would still like some small donation.

One program that must be mentioned (yet again) is a version of that original adventure program by Crowther and Woods – Colossal Cave Adventure. In many ways this was the program that started the adventure craze on computers back in the 1970s and has become a classic on every micro for which it has been converted.

I got my copy from Advantage who charge £10.95 for membership and then £7.95 for this disc; £9.95 for non-members. Colossal Cave Adventure is a good version of the original. It has no graphics, and is not an easy game.

For those very few who do not know this one, you are in a fantasy world of trolls and dwarves searching for treasures through underground tunnels and caves. This version is very complete and if you have the programming skill, it allows access to all files for you to play around with – not recommended for but a very few!

Another version is on Rainbird's Jewels of Darkness, a compilation of three of Level Nine's classic adventures. This will cost you £19.95 and you get two other excellent adventures as well – Adventure Quest and Dungeon Adventure.

All have graphics, albeit fairly rudimentary, and a very good command interpreter. Whichever your choice, no adventure collection is complete without a version of Colossal Caves.

More for DIY

Writing your own adventures is a fascinating pastime. Gone are the days when you first had to learn all about programming the computer. With the game creator programs now available you can concentrate on writing a better adventure.

One of the first of these DIY programs was The Quill, from Gilsoft. For the Spectrum, this has recently been superseded by PAW – the Professional Adventure Writer.

Specifications for this program look very good, and PAW will also include versatile graphics facilities. The bad news is that we will have to wait until nearly Christmas for a comparable Amstrad version.

The slightly better news is that there will be a version out very soon that runs under CP/M. This will run on any Amstrad with a disc drive and could be of great interest to PCW owners.

A minor snag is that CP/M does not support graphics, but if the interest is there, Gilsoft is prepared to introduce an add-on graphics package.

A couple more DIY items have appeared from Incentive Software. First is an excellent little booklet of hints, tips and

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generally useful information that will help any user of Incentive's Graphics Adventure Creator. The GAC Adventure Writers Handbook has only 46 pages but is well worth the £1.25 it will cost you.

Second goody from Incentive is a giant 200 page double sided A4 adventure designer pad. Ideal to help keep track of what is where in building up an adventure. With each page dedicated to one 'room' there are spaces for room number, description, local conditions and what the connections are to other locations. Cost of this mammoth offering is £9.20; seems expensive but it is worth it to keep all those rooms filed away and under strict control.

Both items are available by mail order from – Incentive Software, 2 Minerva House, Calleva Park, Aldermaston, Berks RG7 4QW.

On its way

The next adventure from Melbourne House will be The Mystery of Arkham Manor. Part of the pre-release build-up was to send out demo programs. These were unfinished, so although I could wander around at will, the puzzles and objects were not accessible – so what the final version will play like is anybody's guess.

You play an investigative journalist of the 1920s trying to solve the mystery behind the disappearance of one Colonel Fortescue, a former member of the war cabinet.

You must question the locals and send regular reports and photographs to your newspaper. For this purpose you have a notebook and a camera, both of which play an important part in your success, or otherwise in solving the mystery.

The game has some nice animated graphics and a system of pull down menus that should solve those problems of trying to find the right word. In fact the game is said to rely less on using objects and more on talking to other people to get at the facts.

At this stage the game looks good, rather like a cross between Kwah! and The Forth Protocol. We wait for the definitive version with baited breath.

ACU

RATINGS

	Necris Dome	Apache Gold	Dragon-world	Colossal Cave
Plot	50	60	70	73
Atmosphere	55	65	70	75
Addiction	57	65	72	77
Difficulty	57	55	65	80
Overall	54	63	71	75

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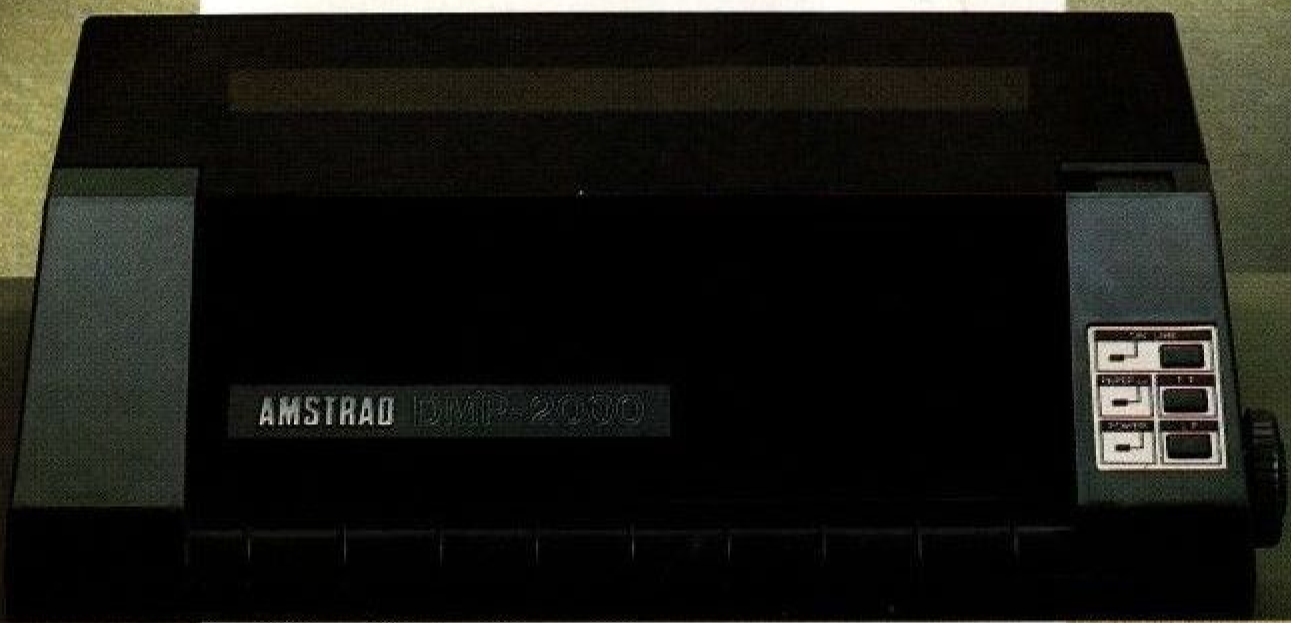
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All this and Maxam II . . .

Maxam II, others nil. That's Peter Green's verdict on the new disc-based development system from utility experts Arnor.

As my fan (hi, Mum) has probably noticed, I have a great fondness for Arnor's Maxam assembler/Protext editor combination. It has been used to write and test all the programs in my Assembly Point series, as well as commercial programs on the CPC and PCW computers (the latter by generating the machine code on a CPC as a CP/M .COM file which can then be run directly on the 8256), and Spectrum machine code programs ported across on tape using ZXSAVER, the reverse routine to my ZXLOADER published in an earlier issue of *ACU*.

I mentioned in one comparative review at the time of release that I had bought Maxam rather than use a rival product sent free for review.

The Shaggy Softwareperson who haunts the pages elsewhere in this mag is also a Maxam enthusiast, but as he pointed out a few months ago, it isn't all it could be.

His main complaints, which I echo, were that Maxam has no proper monitor for debugging machine code programs, and that the disassembler text files cannot feed the assembler.

Now, after a lengthy period during which Arnor has been occupied with PCW versions of the Protext suite, a C compiler and BCPL, comes the product assembler freaks have so long been panting for – the Maxam II development system.

It goes a long way to fixing all the deficiencies of Maxam and provides an excellent set of tools for writing, assembling and debugging Z80 machine code.

CP/M+ only

Maxam II is supplied as a fat ring binder containing the 157 loose leaf pages of the manual and a 3in master disc in a plastic pocket.

The product runs under CP/M+ only, so it is only suitable for use on the CPC 6128 or PCW 8256/8512. On the 6128 it cannot be used to debug programs that are intended to run as expansion roms or under Amsdos or tape – sorry, 464 and 664 owners, you need read no further.

Also both the large and small versions of the monitor are bigger than the 16k of a CPC expansion rom, so it would be a major project to add the software to Arnor's CPC rom range. When I spoke to Arnor I was effectively told that they'd like to do it but not to hold my breath waiting.

As always with disc software, the first thing you do is make working discs from the master, which is then hidden away safely. The instructions in the manual describe how to make Start-of-day, Maxam LARGE and Maxam SMALL discs.

In the case of PCWs or 6128s with two disc drives, this is almost completely automated by using EXEC files. Such a disc allows a CP/M+ cold boot to automatically load and enter APED, the Arnor Program EDitor.

The assembler and monitor functions can be called from within APED, which first saves its current state on disc for later retrieval. This means you can be writing one program, stop and assemble a second program, then debug a third, and finally return to the first job without having to type a single LOAD or SAVE.

APED handles everything itself using temporary files, although this only works completely transparently if you have sufficient disc space to hold all the files at once. Otherwise you'll have to do a lot of disc shuffling. The temporary files are the ones that appear with names such as APED.V, APED.T and APED.1.

What the manual doesn't mention anywhere, and should, is which of the files on the master disc do what.

The working discs for the monitor are simply disc copies of each side of the master, which include a lot of stuff you don't need and consequently waste workspace.

So, for the record, the text editor APED uses APED.COM and APED.HLP. The assembler is MA.COM, the large monitor uses MM.COM, MM.COD, MM.DAT and MM.HLP, while the small monitor uses MSM.COM, MSM.COD, MSM.DAT and MM.HLP.

More disc space can be obtained by deleting the help files, (extension .HLP), in which case you lose the on-screen help messages.

The first stage in producing a piece of machine code is to write the source code, for which purpose APED is provided. This is essentially the same as PROG mode in Protext; that is, there's no word-wrapping, rulers, or other purely wordprocessing features.

Lines may be wider than the screen, and trying to type over the right edge of the screen causes the text to shift half-a-screen to the left rather than force a carriage return.

The editor has two modes: edit for typing the text in and command for executing the various functions. You flip between the two using the Esc key.

Screen response is fast, and a multitude of cursor movement commands (by character, word, line, screen or to either end of the text) make editing quick and easy. Numbered markers can be embedded in the text, so you can jump around without losing your place.

Search extended

Single blocks of text can be marked, and moved or deleted. The search-and-replace function has been extended. To the existing options such as global or not, case-sensitive or not, automatic replacement or not, has been added "find nth occurrence", where n is a number 1 to 255.

As the example in the manual shows, searching for " using options G2 (global search for every second occurrence) ensures that all quotes in a piece of text come in pairs.

Unfortunately, you still can't do search-and-replace within a marked block of text. This would be a very useful facility for programs that use a number of similar subroutines – like

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triangle_1 and triangle_2 in this month's Assembly Point.

It would have saved time if I could have written and debugged the triangle_1 routine, marked it as a block, duplicated it, then done a block search-and-replace to alter all the label references from 1 to 2.

Instead I had to change them by hand, which can be dangerous if you miss any (especially in a case such as JP Z,loop2 staying as JP Z,loop1 – this will assemble correctly but follow a completely wrong path when you run it).

I've mentioned this point to Arnor and the company's policy of continual product improvement (the review APED is already version 2.05) means that it may well appear on later releases.

One good improvement is that if you make a mistake typing a command line you can now move the cursor and fix the error – the old Protext would only allow you to delete back to the mistake and retype.

The most annoying thing is that some of the keystrokes I know instinctively from the CPC rom Protext, are different in APED. For example, Control-A, which deletes a line on the rom version, is used in APED for a new function, swap adjacent characters (lets you correct typing to typing with one keystroke).

Perilous

Line delete for APED is Control-Clr, used on rom Protext to move a block of text! This one change alone has potential for causing real grief.

Arnor say that the APED control keys were chosen for best use of the PCW keyboard, and the 6128 keys had to follow suit. As a 6128 user, I say – **!*!#$&**!

One final point, APED allows you to have files larger than the computer's available memory, the only limit on file sizes being the amount of storage available on the discs. As Arnor points out though, large files are not necessarily a good way to work on a program source file. It's certainly quicker to work with a lot of small files.

The assembler is pretty much the same as my beloved Maxam I, but the added features make even more of a winner. The most striking addition is that Maxam II is a macro assembler.

Macros are a system in which you define new assembler instructions, which you can use as if they were proper microprocessor op codes. On assembly, each occurrence of a macro name is replaced by the corresponding sequence of instructions you have defined. You can also pass parameters, as in this example:

```
MACRO EX-REG $reg1 $reg2 ;define a macro called EX-REG using two
;parameters
PUSH $reg1 ;push registers on stack
PUSH $reg2
 POP $reg1 ;pop them off in the opposite order
 POP $reg2
     MEND ;macro definition ends
```

If your source code reads:

```
EX-REG HL BC
EX-REG IX DE
```

then the actual machine code generated is as if you had actually typed:

```
PUSH HL
PUSH BC
POP HL
POP BC
PUSH IX
PUSH DE
POP IX
POP DE
```

See? Your source code becomes shorter and easier to read and understand, but you should always check you really need a macro and not just a subroutine, otherwise the object code can grow to a ridiculous size.

Further useful additions to the list of assembler directives are STR (same as TEXT, but sets the top bit of the last letter automatically). Thus in Assembly Point this month the listing could read:

STR "TRIANGLE"

instead of:

TEXT "TRIANGL","E"+&80

More advanced conditional assembly is allowed, using REPEAT . . . UNTIL.

As well as linking several source files together at assembly time by using the READ directive (which scans several separate text files held on disc), Maxam II can link assembled modules together using the SYM and LINK directives.

The catch is that code to be linked must be relocatable, which is a whole new can of Babelfish. Real clever clogs can also link assembler modules with Arnor C programs. The examples I've seen of C source code make programming in Serbo-Croat look easy. (Query – aren't high level languages supposed to be *easier* to read than assembler?)

Watching the Defectives

Finally we come to the third and newest part of the Maxam II package – the monitor, which lets you watch all your mistakes unfold on the screen.

This really is a cracking bit of software, the only disadvantage being that it takes up a fair bit of user ram itself. That's why Arnor supplies two versions on different sides of the master disc – a fully-featured version and a stripped-down version for use when memory is tight.

The diagram shows how the "front panel" is laid out. The real business takes place in the three larger windows. Of the two squarish ones in the centre of the screen, the lefthand one either displays a list of memory locations pointed to by a variable called

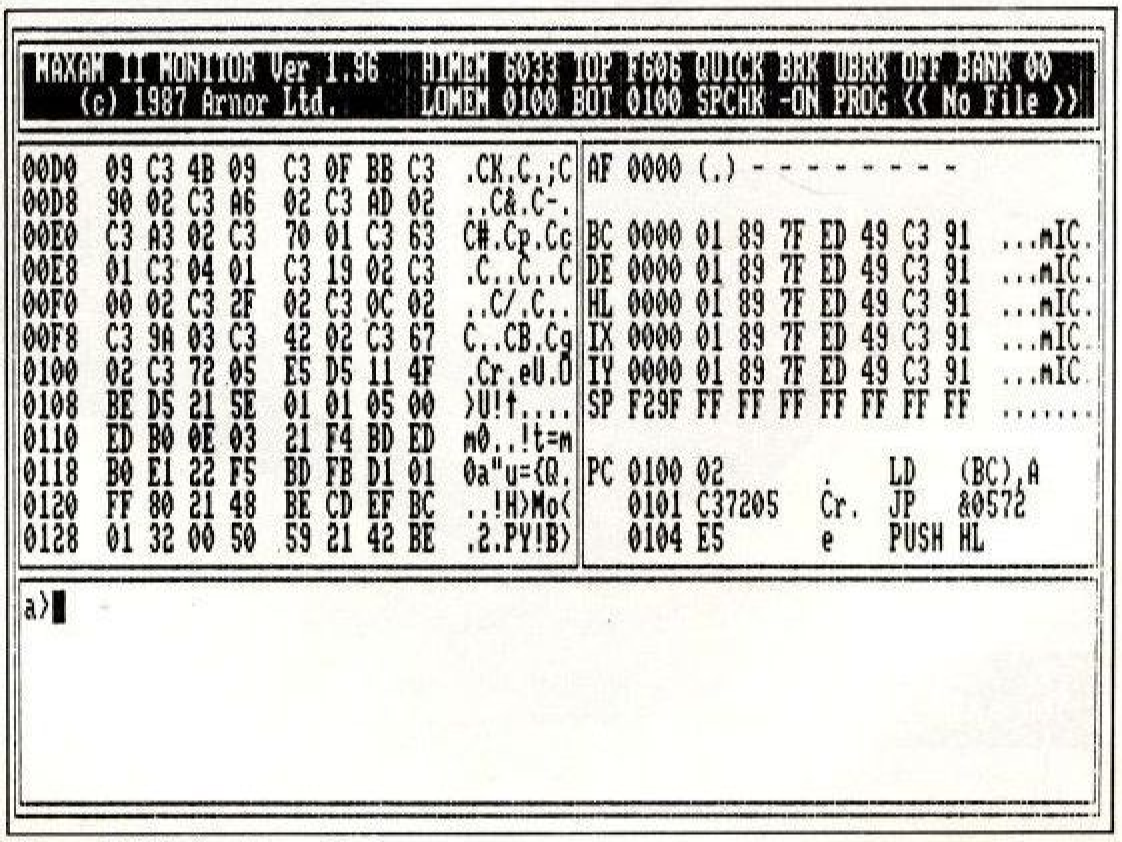


Figure I: The front panel

MP (memory pointer) in hex and Ascii, or a disassembly of those locations (confusingly, the manual calls the disassembly mode "Ascii mode").

The righthand window is the register window, which displays the contents of the main (not alternate) register set, the states of the flags, the stack pointer and program counter.

Also, each of the 16 bit registers has a list beside it, in hex and Ascii, of the contents of memory starting at the address in the register. This means that, when using 16 bit registers as pointers to memory, you can see, not only the address pointed to, but what's actual at that address. The contents of the stack are similarly displayed, while against the PC (program counter) you have a disassembly of the op-codes in that area.

The monitor allows you to load and run a program to be debugged while watching the effect of the instructions on memory, registers and flags – all while remaining in complete control of the machine. This is called single-stepping a program.

Maxam II can do much more, though. You can stop at any point, change values in any or all of the registers, and carry on where you left off. You can check for special conditions by setting what are called "conditional breakpoints". For example, you can tell the monitor to run the program at full speed until the BC register contains zero and the HL register contains &C000, then stop. This is invaluable for trapping all sorts of obscure bugs.

Other types of error checking can be used, such as issuing a warning if the stack is going to overflow, if a warm boot is attempted, and so on.

Some readers may be wondering how the monitor is able to keep control of the computer while running a bugged program when it should cause a crash. The answer is that the code is not run directly on the chip in the machine, but is simulated on a software version of the Z80.

This makes execution slower (no bad thing when debugging) and means that the monitor, not the faulty program, is actually in charge of the computer. It is possible to crash the monitor, but it isn't easy.

Manual labour

The only thing that lets down an otherwise excellent product is the manual. Before Arnor reaches for the phone let me say that it's a lot better than many other manuals, but you really have to dig for some of the information, even with an index.

You *can* disassemble an object file to disc, but looking up all the entries under Disassemble in the index won't tell you how. In fact you use SPOOL to copy all screen output to a disc text file, then use FD to disassemble a disc file. And it STILL isn't a form that assembler can cope with.

Arnor is considering my suggestion to use up part of the 25k that's still free on the master disc with a Hairy Hacker-type filter program to fix this.

In conclusion, despite one or two disappointments, Arnor has yet again delivered the goods. This is a really excellent piece of software which, given the speed with which debugging can be done, will pay its way very quickly even at a price of £79.95.

This assumes you're serious about software development under CP/M+, of course – there's nothing here for 464/664 owners, who will have to wait and see whether anything tumbles from Arnor's sleeve in the future.

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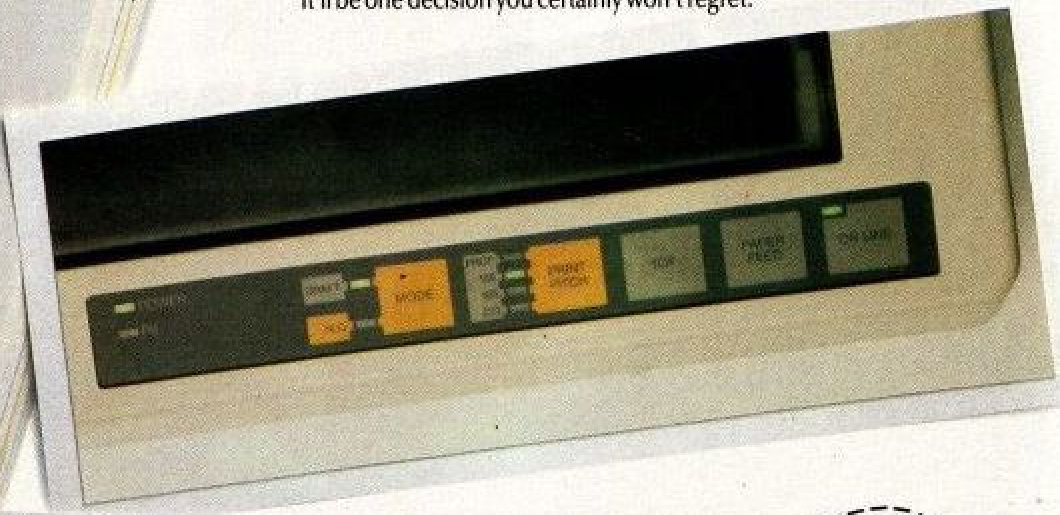
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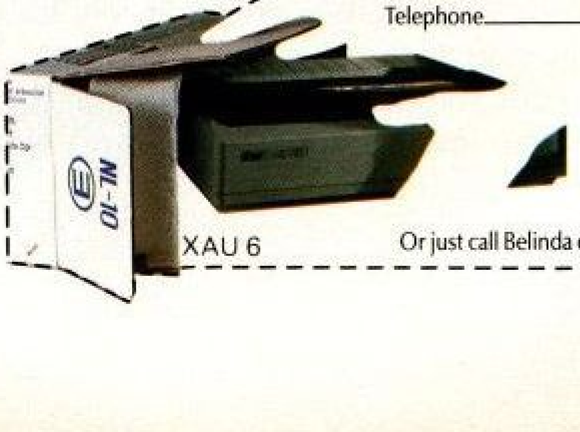
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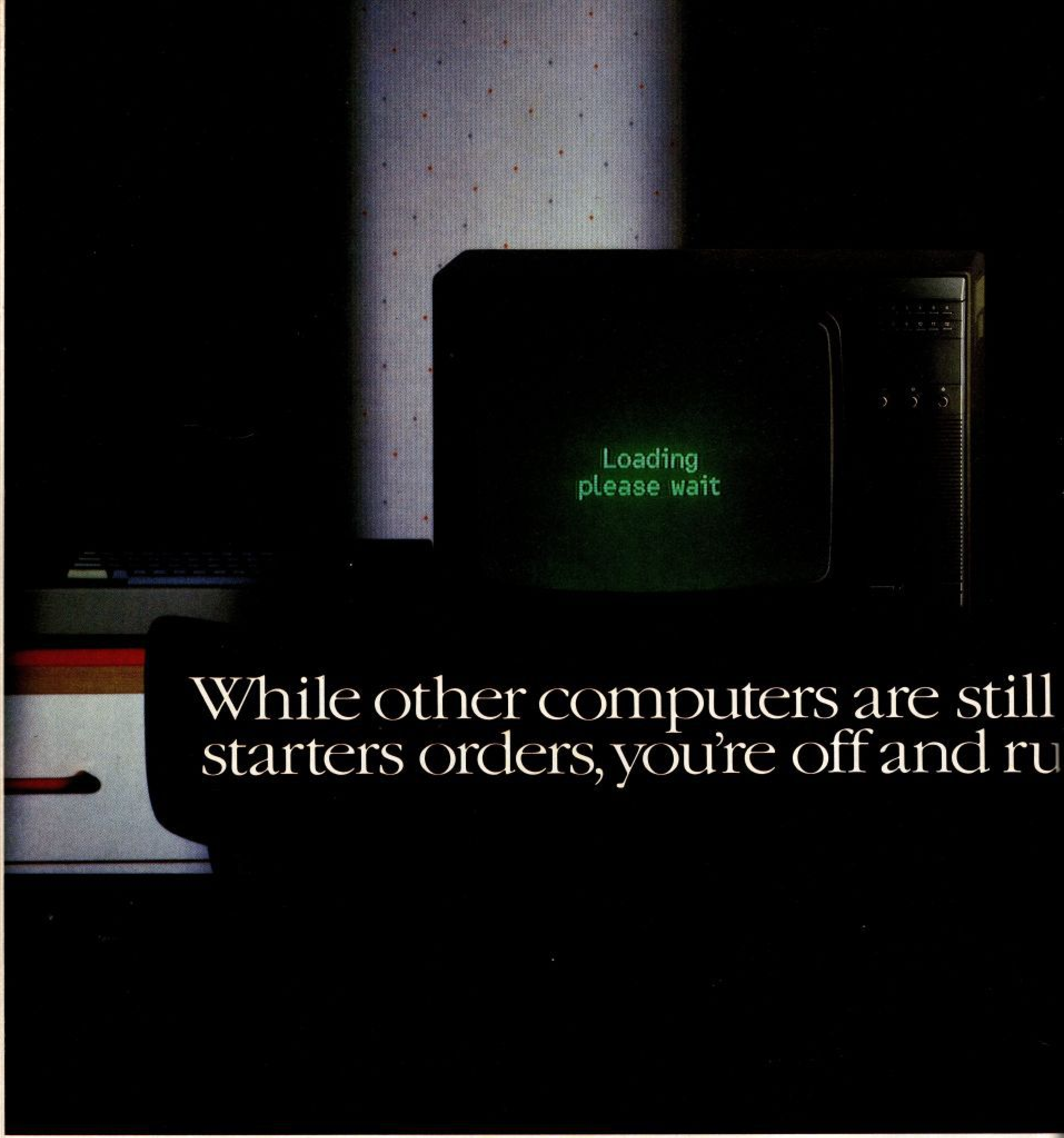
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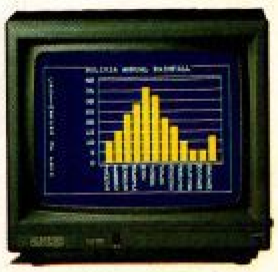
Its fast loading disc drive unit.

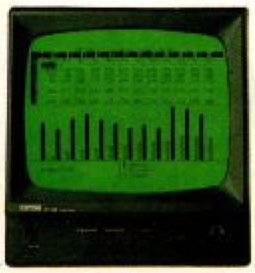
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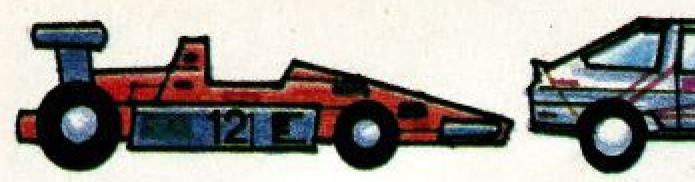
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Motor racing on the CPC

If you want to let the good times roll take to the open road with John Baker

It is generally agreed that driving is fun. Thinking back to those heady learner days at the wheel of a dual control Datsun, it is now worrying to consider that at the time I was constantly considering what good value £5 pounds per hour was.

After all, it would cost you twice that to stay an hour on any fairground bumper cars – and here I was, for real, with real cars and real people to crash into. Great!

But if you think that ordinary plodding around town is a wheeze, then driving fast, really fast (only to be done on a racing circuit please) is something else completely.

The best day out I ever had was a day at racing school at Brands Hatch. Driving fast in a performance car under these conditions is a breathtaking experience. Combine this with the glitz and glamour of the motor racing world, and if you could put the whole thing on to a computer, you'd have a winner.

Computer games attempting to simulate motor racing have been with us since the ZX80, but fear not, things have got a lot better since then on the CPC. In fact, looking back on the selection available for Arnold, is a bit like taking a drive down memory lane.

Memory highway

Grand Prix Driver out on the Amsoft label, was written by Britannia Software back in the good old days of 1984. On second thoughts, taking a look at the game, maybe they weren't that good after all.

Shared by all the action games – we'll come to the strategy later – the track scrolls at you out of the horizon, but unlike some others, yuk, isn't it jerky? Or maybe it's a case of a slightly heavy foot on the clutch.

In any case, block graphics are the order of the day, as you manoeuvre your car (handling like a three week old sponge pudding) left/right, faster/slower, attempting to pass a maximum of 30 cars in order to win the race. This will take you 10 minutes, and if you can stand to play the thing that long, you're a better man than I. For nostalgia freaks only.

The same can be said for another Amsoft golden oldie, 3-D Grand Prix. A classic in its time, but in the cold light of May 1987, it looks more than a little dated. Yet surprisingly, some games from that era can still satisfy the aspiring racing fiend.

Rue de Rally

Grand Prix Rally II, again published by Amsoft but programmed by the very French Loriciels team, dates from only a slightly later period, but still has a quality all of its own.

Here you drive what looks like a light blue Lotus Esprit over a series of rally stages against the clock. There are two bars across the top of the screen, one showing how much time you have left, the other how much of the stage you have completed.

Rallies being what they are, there are other cars on the track to get in the way. You must pass them, which will gain you extra time, but avoid touching them, as this will cause you to crash, not surprisingly, losing you Brownie points.

The controls are very simple, although a little unusual. The left/right is normal enough, but you'll find the car is constantly accelerating, only slowing down if you press the fire button. Maybe Citroen make them like that.

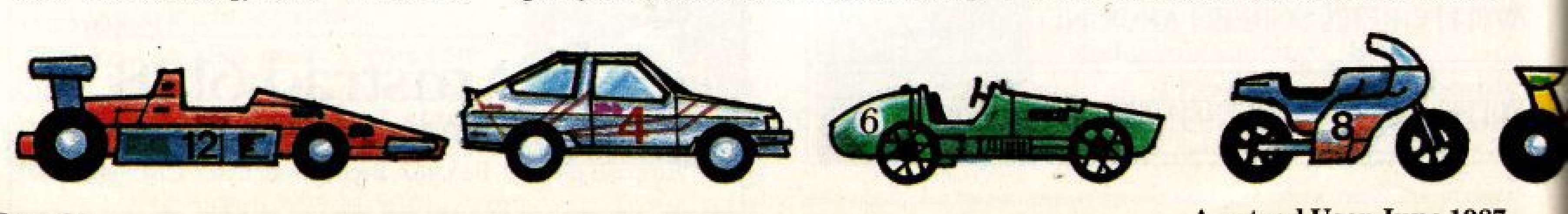
Each stage has its characteristics, the night driving being particularly effective, and a neat extra is that you can edit/create your own stages and save them to tape. Rally II might not be state of the art, but it holds its own well against the more recent contenders.

More recently it has been possible to do your motor racing on a tight budget. No, I'm not talking about Formula Ford, but those wonderful people Mastertronic, who have produced two games, both vastly popular, Formula One Simulator and Speed King.

Calling the first one a racing simulator is about as reasonable as equating a flying lesson with jumping off a chair, but as a game, it's not bad at the price.

You have a selection of 10 tracks to race around, with a good out of the windscreen view, displaying the steering wheel, wing mirrors and tyres, and so on, which as you steer left and right, move accordingly.

The top of display shows the time taken so far, the gear you are in and



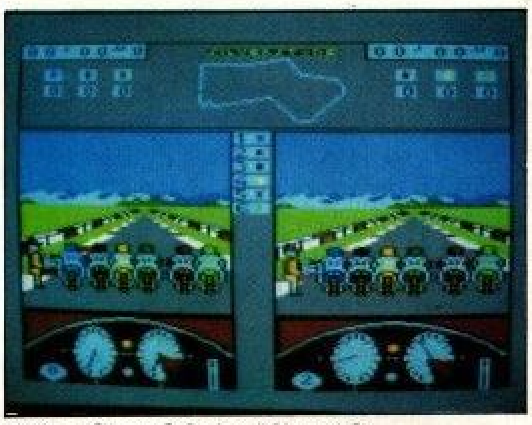




Formula I Simulator: Mastertronic



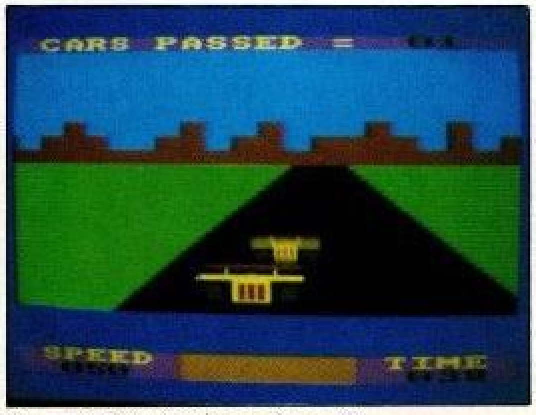
Speed King: Mastertronic



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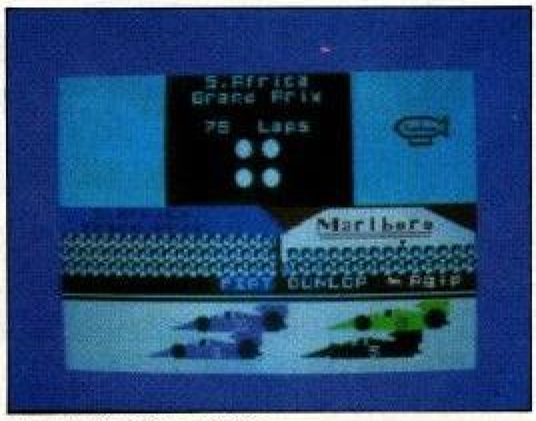
Endurance: CRL



Grand Prix Driver: Amsoft



TT Racer: Piling on the revs



Formula One: CRL



Grand Prix Rally II: Amsoft



TT Racer: On the grid

current speed. Yes, gears rear their ugly head, and you have to use them or you blow the engine up, although you can select automatic gear change to avoid that eventuality.

Budget Boulevard

After you've qualified, it's on to the race. You can see from the screen shot, the opposition are a bit two dimensional.

Perhaps they're all James Hunt? The game has its drawbacks, but for £1.99, you can't complain that it's not excellent value for money.

The same can be said of Speed King, now under the Mastertronic label, but originally pushed out by Digital Integration. This deals with the thrills and spills of motor cycling, racing against 20 other riders, all eager to knock you off your steed.

Again a choice of 10 tracks means you'll not get bored easily, and the action can get very fast, hammering down the straights in 6th at more than 200mph. The game has three levels of difficulty, so it's very easy to get into. Great at full price two years ago; at budget, it's a steal.

Silverstone rocket

Digital Integration hasn't been keeping still when it comes to bike racing. It's recently released TT Racer must be the most comprehensive racing simulation available on the CPC.

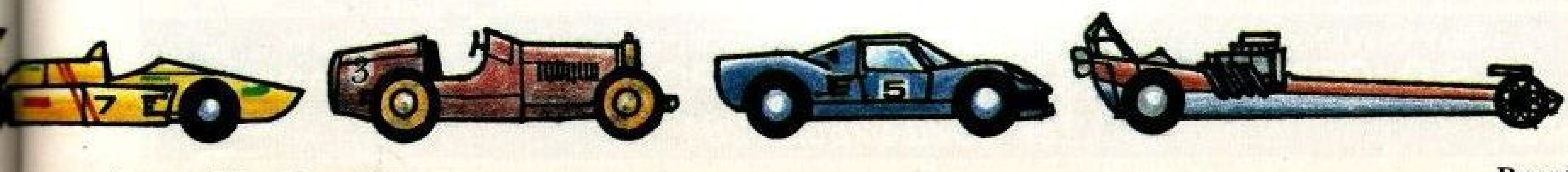
There are many things to think about before you start – setting up the gear ratios, and the steering speed . . . what kind of tyres should you be using?

The main racing menu is more than comprehensive. Choice of engine size, level of competition, track (one of 12 or you can compete in a full season), save/load options, automatic/manual gear change and more. A lot of effort has been put into the program to make the performance as realistic as possible. TT Racer can only be faulted on the actually animation within the races.

You are given an "over the handlebars" view of the world that puts you well and truly in the driving seat. When you lean the bike over, you really do lean, and the horizon angle alters accordingly.

Instrumentation is comprehensive, and the controls are simple to use, though again, convincingly well simulated. Rev the bike up and drop the clutch in first gear – wheelie!

The race itself is against 15 other riders, one of which can be a friend (who gets his own independent view of the track) if you connect two Arnolds





together via an RS232.

Your practice time gives you your grid position, then it's off. There's no denying that the track animation is a bit jerky, so much so that I found it difficult to convince myself that I was really trucking down that freeway. But you can't fault it on accuracy, so it's still highly recommended.

Finally, there's 500cc Grand Prix from the French company Microids. Again it's motorbikes, but this gives you a split screen view, so two players can go for it at once.

Again, with three levels of difficulty it's not difficult to get up and running, and there's a choice of various world famous tracks to race on.

It's a matter of simple fast/slower, left/right controls, with the fire button changing gear. It's colourful, zippy, and great fun as a two player game, with some smooth track scrolling.

The current choice of action games must be between TT Racer and 500cc Grand Prix. For accuracy of simulation, I'd go for the former. For pure fun, it's got to be the latter, although they're different enough to warrant having both in your collection.

So there you have it, a whole range of titles that should have something for every budding world champion. For that extra bit of realism, don that crash helmet and borrow that hair drier. Silverstone, here we come!

Strategy

Of course gadding around on the race track, risking your neck, is not everyone's bottle of champagne. So people like to be the mastermind behind the success, the power behind the throne.

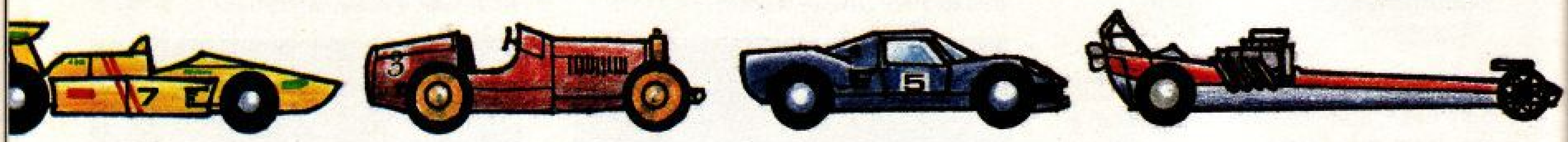
You are given this opportunity with two games from CRL, Formula One dealing with the car racing world, and Endurance, allowing you to manage an endurance racing bike team.

Both are what you might call motor sport equivalents of Football Manager, but very nicely done indeed, with Formula One getting the edge in my book.

You manage a racing team for a whole season, choosing everything, starting from drivers to sponsors, then deciding on how to spend the money. When you get to the race track, you set the car up, choosing tyres, and so on, and then the race begins with the cars wizzing by the grandstand.

As it progresses, you may have pit stops to deal with. You control these via joystick, moving your man around the car as fast as possible. You can call your man in to change tyres if the weather becomes inclement. The thrills and tension are all there. Great stuff for armchair racers.

ACU



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__________ Post code______

ACU



Time for a Japanese plastic printer

Citizen's bold plans to enter the printer market have been very successful to date, giving Epson a run for its money. Grahame Davies looks at the latest offering.

I wonder what printers will be like in five years? I have a five-year-old Epson MX80 F/T wedging a door open and it is interesting to compare it to the Citizen MSP-10E. The latter will emulate the Epson's printing, but fortunately does not imitate its weight.

Anyone who has carried a Centronics 753 printer will readily appreciate this, and for those of you who have not, just imagine carrying three car batteries in a giant box.

The MSP 10 is also lower, slimmer, narrower, thinner . . . in fact one day all printers will be made this way, due to the increased usage of plastics.

There's very little left for the manufacturer to convert to plastic, but as it is made by the Citizen Watch Company I'm sure something will be found.

It could be made smaller as well. Perhaps we'll see a wrist version?

The MSP-10E has a label at the back indicating that it is an AL 10. This identity crisis can obviously be explained away by the fact that AL is not enough letters and that MSP is short for Most Significant Printer – at £349 it really ought to be a significant machine.

The specification seems reasonable – 160 cps, 1k buffer, pinfeed or friction feed, correspondence quality mode, bit-imaged graphics, intelligently bi-directional, Epson-FX compatible.

Oh yes, it is fully IBM compatible as well – but I couldn't get it to run the flight simulator. Incidentally, the manual blesses the printer with an 8k buffer and the box it comes in states it has only a 1k buffer.

Specification

For the price, I would expect a reasonably sophisticated machine so let's take look at the physical features:

A three position lever to the left controls the use of pinfeed and friction feed paper. Pulled fully towards the front, it opens the paper bale and still gives friction feed.

This is awkward when lining up single sheets, especially as the lever is rather stiff and tends to snap into position. A separate lever controlling the paper bale would solve this.

The pinfeed is of the push variety, so the paper passes through the feed before reaching the print head. This makes the printer lower and also means that the first sheet of paper is not wasted.

It also means that if you wind the paper back, there is a good size gap through which to load a cut sheet.

Unfortunately, no matter what position the lever is in the pinfeed always rotates, which means that you cannot have pinfeed paper loaded while printing a cut sheet. I have seen this feature on similarly priced printers (such as the Fujitsu DX Range) where the loading and unloading of the paper is controlled electronically.

Another feature missing is a fine line-up adjustment. This, and moving

the paper backwards, have to be done using the carriage control knob on the right hand side of the printer.

Paper feed

The front panel has three switches labelled ONLINE, LF and FF. They have a good, positive feel to them and no prizes for guessing which does what.

The linefeed advances the paper at a reasonable rate. There would be little point in having a 160cps printer with a slow linefeed rate but it has been known – a case in point is the Dataproducts SPG80x0 range, which is appalling in this respect.

The LF and FF buttons do not work when the printer is online. Once again this is similar to other printers, but I have never followed the logic behind it. It does prevent an accidental touch of the switch moving the paper but this is surely a rare occurrence.

Next time you use a printer, count the number of times you forget to put the printer offline before using linefeed or formfeed, and you may see my point.

What the printer does not stop you from doing is moving the carriage control knob when it is online. I have only come across one printer that did this, a Mannesmann Tally.

On this model, if you tried to wind the paper while it was online the knob would jam and the printer would play a little tune in protest – The Wrong Hand Winding Load by the Beatles I think.

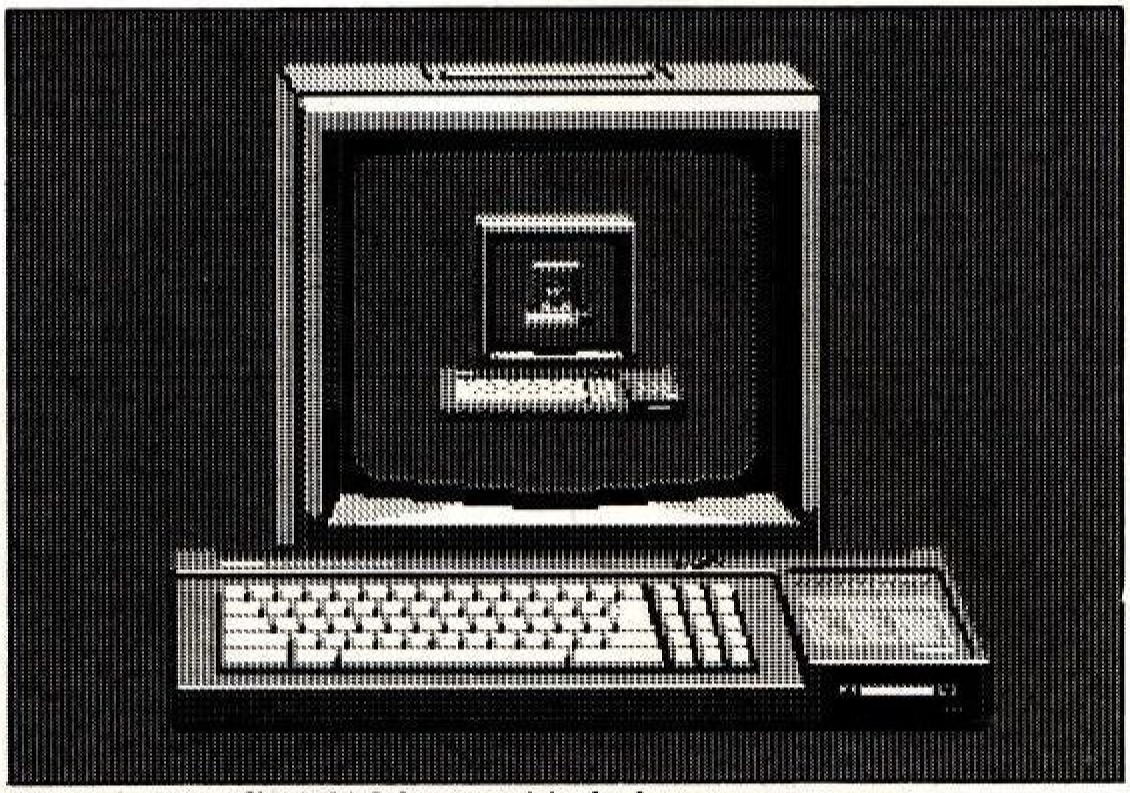
A useful feature of the front switches is the ability to switch between standard and correspondence mode. The printer must be online, then you have to hold the line feed switch down while pressing the online switch. The print head jumps once or twice, depending on the mode.

You can use these buttons while printing and the printer will change mode at the end of the current line. A separate switch to do this would obviously be more convenient and surely not too expensive.

The ribbon is the popular cassette type which is very easy to replace but normally fairly expensive. Removing the plastic cover at the front of the printer allows access to the ribbon and also to a lever on the left. This controls the distance between the print head and the paper and should be used when loading multi-part stationery.

In the manual, Citizen refers to it as a Paper Thickness Lever. Quite a reasonable name, but I think I still prefer the name Penetration Control Knob that Centronics use.

Either way, it normally ends up being used as a "If I just push this lever forward as far it goes, I'll get another few lines out of this ribbon" knob.



Screen dump quality is high but surprisingly slow

Plastic engineering

Two separate plastic sections can be used to help keep incoming and outgoing pinfeed paper apart. These flippers are certainly too thin to reduce the noise level, although the printer is not excessively noisy.

They locate very badly on top of the machine and generally get in the way when changing paper. The usual result is a lot of flippers flapping about and then being left off.

One last comment about design. For someone like me who is constantly swapping equipment, separate power cables are a real help. The only reason for not supplying the cable separately can be cost. It is to Citizens' credit that a mains plug is included.

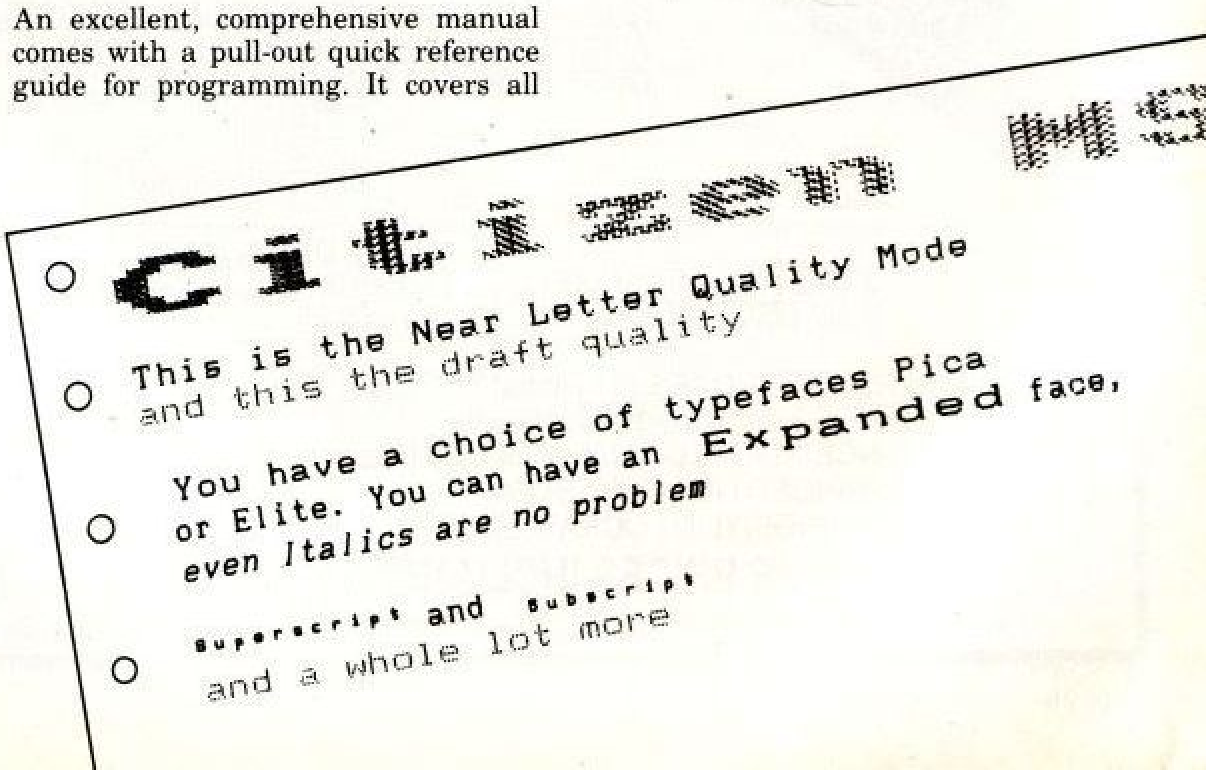
Documentation

An excellent, comprehensive manual comes with a pull-out quick reference guide for programming. It covers all aspects of using the printer with commercial software, discusses individual computers and gives example programs with most commands.

By reading the manual, you quickly realise that the printer has got virtually every feature you could wish for. But by reading quickly you are going to miss out on most of these – so take your time.

At 160cps could you ask for more? Well, yes actually. The problem is, what does 160cps mean? It is all very well printing spaces or full stops quickly but what happens when you print characters like m, or perform a linefeed? Slow linefeeds and formfeeds can negate any advantage gained by fast print speeds, though how much of a disadvantage this is depends on the type of output you are producing.

I don't know how manufacturers



arrive at their quoted print speeds, I think it is safe to assume that most of them simply quote the best attainable speed.

The main point to remember is that as soon as you want to do anything clever, the printer will slow down. And this printer can do lots of clever things such as expanded, doublestrike, compressed, italics, superscripts, subscripts, reverse, double height, graphics, chew paper . . . need I say more?

The feature that most users will immediately use is the correspondence mode. The quality here cannot be faulted but it is at the considerable expense of speed. The output, while good, still looks as though it is from a dot matrix printer – but as the print head is only nine wire this is to be expected.

The printer makes two passes of every line, so print speed is halved. Also, it prints uni-directionally for greater accuracy – an interesting section in the deals with the reasoning behind this.

Each pass of the print head also seems slower and this is probably due to the extra dots being printed. The resultant speed is quoted as 40 cps.

Programming

For the keen programmer, the printer appears to have all the special features you could want and also some for which there seems to be little point – you can make your own mind up about the following selection:

- The printer is capable of printing a zero with or without a slash through it.
- You can send a command to automatically switch the printer offline and another to put it back online.
- If using cut sheets, it is not possible to print on the last two inches due to the paper-out sensor. This can be disabled by setting a DIP switch inside the printer or by sending an Escape sequence.
- Individual characters may be erased from the buffer, or indeed the buffer can be cleared totally using Escape sequences.
- Finally, an optional serial interface is available as an alternative to the standard parallel one, but no reference to it is made in the manual. I suspect the interface is supplied with its own manual.

Conclusion

At last we come to the verdict: having taken into consideration character witnesses and a previously clean sheet, I mean record, should you go out and buy this printer?

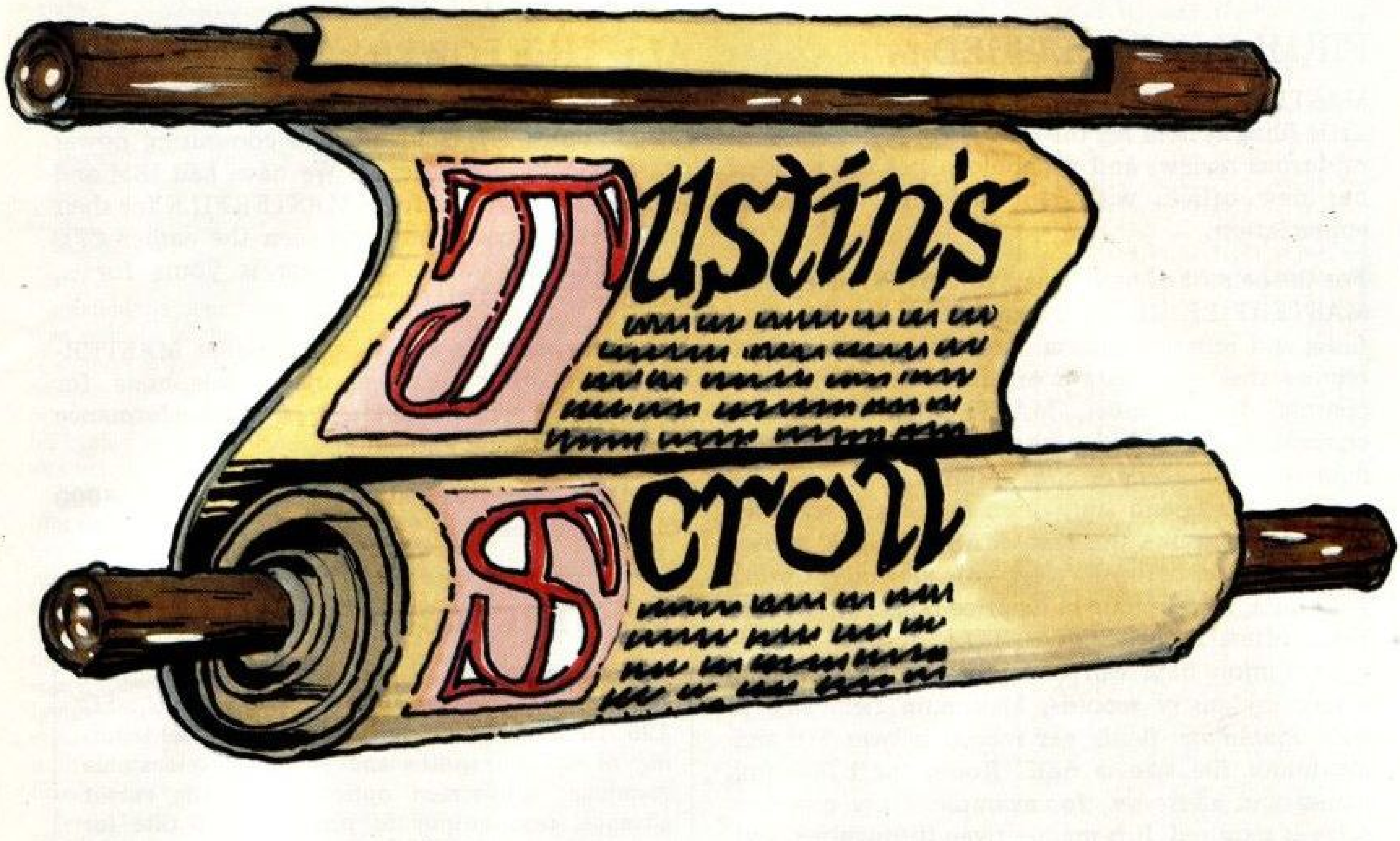
It is certainly very versatile and capable of good print quality, but loading paper proved to be awkward, especially when swapping between pin-feed and cut sheets.

The machine has a cheap feel to it and I continually had the impression that too many cost-saving corners had been cut and that something was going to break – although nothing did.

I am forced to say that at £349 I would not recommend it. However, I am reliably informed that Citizen expects this price to be discounted and it would only take a discount of 15 per cent to bring the price below the £300 mark.

Looking through back issues of *ACU* would indicate this to be the normal price, with big discounters offering even more. Shop around and you may find the MSP-10E to be a bargain.

ACU



Let loose from the Hairy Hacker's confines, Justin Garvanovic presents a routine which is bad for the eyes.

Many moons ago I saw a demo program running on the Commodore 64 (boo hiss) which scrolled a message across the bottom of the screen in a rather unusual manner. The text was larger than normal, and scrolling was as smooth as silk.

But it was not this which impressed me, nor was it the high speed of the operation – many programmers have done that. This routine had something else, a parallax effect; or to put it another way, the message would scroll at one speed (fast) while a pattern behind the text would scroll at another speed (slow).

What's a nice scroll like you doing in a computer like this?

Anything the C64 can do the CPC 464 can do better – well most things – so I set about coding a routine for the 464, 664 and 6128. To make sure the program was fast and smooth I had to make it scroll every frame. A new frame is drawn every 50th of a second and only lasts for 20 milliseconds so the code had to run as fast as possible.

The first problem was deciding how many lines I could scroll in the alloted time, remembering that I had to update the message at the same time. After a bit of trial and error I settled on a total of five lines, as long as I did some jiggery pokery with the screen position.

As I was to scroll five lines, each eight pixels high and 80 bytes long, I could do the scroll in eight 400 byte blocks, each block being moved with the Z80's LDIR instruction.

Unfortunately the LDIR instruction wasn't fast enough. Assembler in hand I resorted to the block LDI. This involves the creation in memory of a number of LDIs one after the other, and in this case we needed 400 of them. The program sets them up at the start and puts a return instruction at the end so they can be called as a subroutine.

All that was then required was for the source and destination addresses to be put into HL and DE respectively before the LDIs were called. This had to be done eight times, once for each pixel line, to move all five character lines.

Adding character

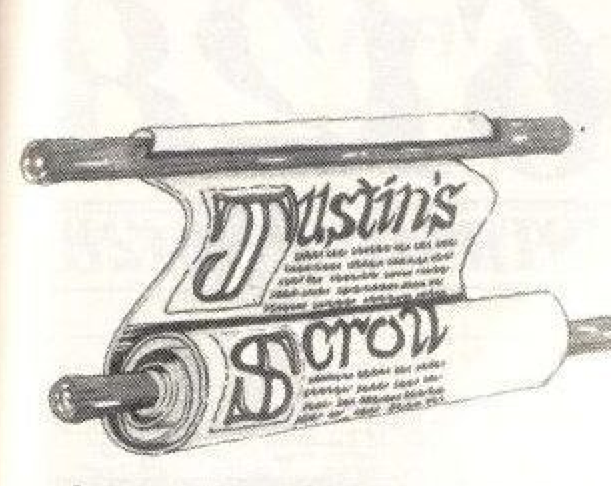
The next problem involved the updating of the character on the right hand side of the screen. Again, this routine needs to be very efficient. To keep the speed up I used one of the Spectrum programmers' favourite tricks. The stack can be positioned anywhere in the computer's memory. This includes the screen ram. PUSHing data on to the stack is very quick, so all I had to do was set the stack pointer to the start of the screen and PUSH the blocks which made up the letters on to the screen. This is a very quick way of moving data anywhere in memory, and has the added advantage of writing two bytes to memory in one go.

Some thought had to be given to the order of the data, as it is written with the high byte in the low memory address.

To end this difficulty the character matrixes were stored on their side so that when a byte was retrieved I just had to rotate the byte and if 1 dropped into the carry I knew that the character cell was set (filled in).

I then just worked down the edge of the screen, rotating the byte each time, until all five lines were done. This led on to the problem of creating the parallax effect, which was surprisingly simple to achieve.

When a cell of the character being printed is empty, instead of just leaving



the cell blank, a pattern of vertical lines was written to the screen. These were in colours 2, 3, 4 and 5 from left to right across the cell. Then all that was needed to be done was for the colours to be cycled to give them the illusion of movement.

This meant I was left with text scrolling in four pixel jumps while the vertical lines in the background were only moving in two pixel jumps. Everything licked? Not quite. This left one problem, in that it still didn't get everything done in time. No programming tricks could speed up the routine, so I solved/bodged the problem by moving the screen down a few lines giving me just a little more time before the raster finishes drawing the frame.

So all that's left now is for you to type in the programs in the following manner:

- If you are using a disc drive, just type in Program I and run it. This will create the machine code for the scroll.

  Then type in and run Program II which allows you to type in your message and see it scroll.
- If you are using a tape, type in Listing I and save it. Type in Listing II and save that directly after Program I.

  Note the number of the tape counter and rewind the tape to the start of Program I. Load Program I but DON'T run it.

  Forward the tape to the noted position and run Program I. Then rewind to the start of Program II and run it.

Happy scrolling.

```
10 MODE 1:MEMORY &7FFF
20 loc=&8000
30 lin=1000
40 tot=0:LOCATE 1,1:PRINT "working on line";lin
50 FOR n=1 TO 8
60 READ a$:a=VAL("&"+a$)
70 tot=tot+a:POKE loc,a
80 loc=loc+1:NEXT n
90 READ sum
100 IF tot<>sum THEN PRINT "Error in line ";lin:END
110 lin=lin+10
120 IF tot<>0 THEN GOTO 40
130 SAVE "scr-code",b,&8000,&310
140 PRINT "finished.":END
1000 DATA 01,07,bc,ed,49,04,0e,1a,550
1010 DATA ed,49,01,05,bc,ed,49,04,818
1020 DATA 0e,02,ed,49,af,32,10,83,698
1030 DATA 3e,06,32,11,83,21,34,86,485
1040 DATA 22,0a,83,21,13,83,01,90,503
1050 DATA 01,36,ed,23,36,a0,23,0b,587
1060 DATA 78,b1,20,f5,36,c9,f3,06,1078
1070 DATA f5,ed,78,1f,30,fb,3a,11,1007
1080 DATA 83,fe,06,ca,5b,80,2a,0c,866
1090 DATA 83,cd,92,80,22,0c,83,cd,992
1100 DATA b3,80,21,11,83,34,cd,7c,869
1110 DATA 81,18,db,2a,0a,83,7e,fe,935
1120 DATA ff,28,1a,23,22,0a,83,cb,734
1130 DATA 27,4f,cb,27,81,16,00,5f,606
1140 DATA 21,44,82,19,22,0c,83,af,608
1150 DATA 32,11,83,18,b9,01,07,bc,603
1160 DATA ed,49,0e,1e,04,ed,49,01,669
1170 DATA 05,bc,ed,49,0e,00,04,ed,758
1180 DATA 49,c9,e5,7e,32,12,83,21,861
1190 DATA 92,c6,06,05,3a,12,83,cb,765
1200 DATA 1f,32,12,83,da,00,81,c3,772
1210 DATA 3e,81,11,50,00,19,10,ec,565
1220 DATA e1,23,c9,e5,d5,21,42,c6,1200
1230 DATA 11,40,c6,cd,13,83,21,42,733
1240 DATA ce,11,40,ce,cd,13,83,21,881
1250 DATA 42,d6,11,40,d6,cd,13,83,930
1260 DATA 21,42,de,11,40,de,cd,13,848
1270 DATA 83,21,42,e6,11,40,e6,cd,976
1280 DATA 13,83,21,42,ee,11,40,ee,806
1290 DATA cd,13,83,21,42,f6,11,40,781
1300 DATA f6,cd,13,83,21,42,fe,11,971
1310 DATA 40,fe,cd,13,83,d1,e1,c9,1308
1320 DATA e5,c5,ed,73,0e,83,01,c0,1116
1330 DATA c0,f9,c5,7c,c6,08,67,f9,1320
1340 DATA c5,7c,c6,08,67,f9,c5,7c,1200
1350 DATA c6,08,67,f9,c5,7c,c6,08,1085
1360 DATA 67,f9,c5,7c,c6,08,67,f9,1231
1370 DATA c5,7c,c6,08,67,f9,c5,7c,1200
1380 DATA c6,08,67,f9,c5,ed,7b,0e,1129
1390 DATA 83,c1,e1,c3,aa,80,e5,c5,1468
1400 DATA ed,73,0e,83,01,4c,70,f9,935
1410 DATA c5,7c,c6,08,67,f9,c5,7c,1200
1420 DATA c6,08,67,f9,c5,7c,c6,08,1085
1430 DATA 67,f9,c5,7c,c6,08,67,f9,1231
1440 DATA c5,7c,c6,08,67,f9,c5,7c,1200
1450 DATA c6,08,67,f9,c5,7c,c6,08,1085
1460 DATA 67,f9,c5,ed,7b,0e,83,c1,1247
1470 DATA e1,c3,aa,80,3a,10,83,e6,1153
1480 DATA 03,fe,03,ca,17,82,fe,02,871
1490 DATA ca,ea,81,fe,01,ca,bd,81,1340
1500 DATA 01,02,7f,ed,49,01,4c,7f,644
1510 DATA ed,49,01,03,7f,ed,49,01,752
1520 DATA 54,7f,ed,49,01,04,7f,ed,890
1530 DATA 49,01,54,7f,ed,49,01,05,601
1540 DATA 7f,ed,49,01,54,7f,ed,49,959
1550 DATA 3c,32,10,83,c9,01,02,7f,588
1560 DATA ed,49,01,54,7f,ed,49,01,833
1570 DATA 03,7f,ed,49,01,4c,7f,ed,881
1580 DATA 49,01,04,7f,ed,49,01,54,600
1590 DATA 7f,ed,49,01,05,7f,ed,49,880
1600 DATA 01,54,7f,ed,49,3c,32,10,648
1610 DATA 83,c9,01,02,7f,ed,49,01,773
1620 DATA 54,7f,ed,49,01,03,7f,ed,889
1630 DATA 49,01,54,7f,ed,49,01,04,600
1640 DATA 7f,ed,49,01,4c,7f,ed,49,951
1650 DATA 01,05,7f,ed,49,01,54,7f,655
1660 DATA ed,49,3c,32,10,83,c9,01,769
1670 DATA 02,7f,ed,49,01,54,7f,ed,888
1680 DATA 49,01,03,7f,ed,49,01,54,599
1690 DATA 7f,ed,49,01,04,7f,ed,49,879
1700 DATA 01,54,7f,ed,49,01,05,7f,655
1710 DATA ed,49,01,4c,7f,ed,49,3c,884
1720 DATA 32,10,83,c9,1e,05,05,05,443
1730 DATA 1e,00,1f,15,15,15,0a,00,134
1740 DATA 0e,11,11,11,0a,00,1f,11,123
1750 DATA 11,11,0e,00,1f,15,15,11,138
1760 DATA 11,00,1f,05,05,01,01,00,60
1770 DATA 0e,11,11,15,0c,00,1f,04,116
1780 DATA 04,04,1f,00,11,11,1f,11,121
1790 DATA 11,00,11,11,0f,01,01,00,68
1800 DATA 1f,04,0a,09,11,00,1f,10,118
1810 DATA 10,10,10,00,1f,02,0c,02,95
1820 DATA 1f,00,1f,02,04,08,1f,00,107
1830 DATA 0e,11,11,11,0e,00,1f,05,115
1840 DATA 05,05,02,00,0e,11,15,19,89
1850 DATA 1e,00,1f,05,05,0d,12,00,102
1860 DATA 12,15,15,15,09,00,01,01,92
1870 DATA 1f,01,01,00,0f,10,10,10,96
1880 DATA 0f,00,03,0c,10,0c,03,00,61
1890 DATA 0f,18,0c,18,0f,00,11,0a,117
1900 DATA 04,0a,11,00,03,04,1c,04,70
1910 DATA 03,00,11,19,15,13,11,00,102
1920 DATA 00,08,00,00,00,00,00,00,8
1930 DATA 00,00,00,00,04,04,15,0e,43
1940 DATA 04,00,04,0e,15,04,04,00,51
1950 DATA 15,0e,1f,0e,15,00,04,0e,119
1960 DATA 1f,0e,04,00,00,00,00,17,72
1970 DATA 00,00,00,00,00,00,
```

Program I

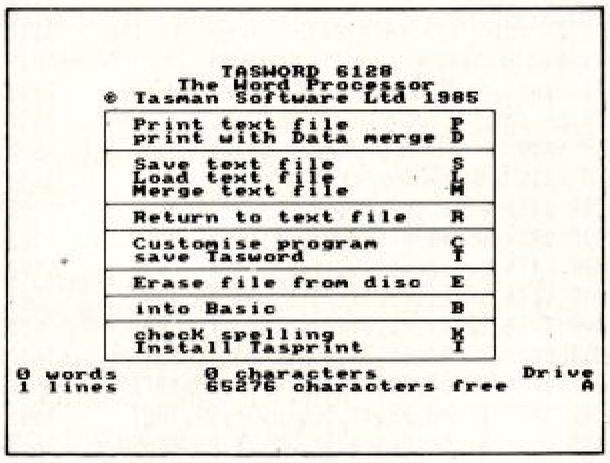
```
10 MODE 1:MEMORY &7FFF
20 LOAD "scr-code",&8000
30 FOR i=0 TO 5
40 READ a:INK i,a
50 NEXT i
55 BORDER 0
60 DATA 0,26,6,0,0,0
70 PRINT "Do you want to :"
80 LOCATE 1,3:PRINT "(1) - Go back to basic at the end of the       message."
90 LOCATE 1,6:PRINT"or"
100 LOCATE 1,9:PRINT "(2) - Start from the beginning ?"
110 a$=INKEY$
120 IF a$="1" THEN GOTO 170
130 IF a$<>"2" THEN GOTO 110
140 POKE &807D,&C3
150 POKE &807E,&14
160 POKE &807F,&80
170 CLS
180 PRINT "Enter the message "
190 loc=&8634
200 INPUT m$
210 FOR m=1 TO LEN(m$)
220 c=ASC(MID$(m$,m,1))
230 IF c=46 THEN c=26:GOTO 310
240 IF c=32 THEN c=27:GOTO 310
250 IF c=42 THEN c=30:GOTO 310
260 IF c=61 THEN c=31:GOTO 310
270 IF c=60 THEN c=29:GOTO 310
280 IF c=62 THEN c=28:GOTO 310
290 IF c>64 AND c<91 THEN c=c-65:GOTO 310
295 IF c>96 AND c<123 THEN c=c-97:GOTO 310
300 PRINT "I'm sorry you cant use a ";CHR$(34);CHR$(c);CHR$(34):END
310 POKE loc,c
320 loc=loc+1
330 NEXT m
340 POKE loc,255
350 MODE 0:CALL &8000
360 MODE 1:GOTO 30
```

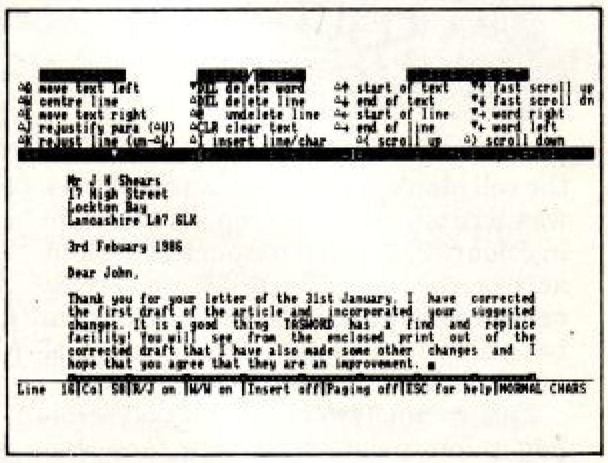
Program II

TASWORD 6128

THE WORD PROCESSOR FOR THE AMSTRAD CPC 6128







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A powerful and easy to use word processor and a superb data merge program.
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TASWORD 6128 is the word processor especially developed to utilise the extra memory in the CPC 6128.
The program uses ALL the additional 64K of memory in the CPC 6128 as text space. This means that text files can be around ten thousand words long.
TASWORD 6128 includes a built-in data merge program. Mail merge, in which a letter is printed any number of times, each individually addressed to a different person, is just one of the applications of this powerful facility.
The notepads are a unique feature of TASWORD 6128. Four separate notepads are available. Typing reminders and storing letter headings are just two possible applications for the notepads.
Up to one thousand characters can be stored in ten user definable keys allowing commonly used words, sentences, or even paragraphs to be typed with a single keypress.
TASWORD 6128 has comprehensive customisation features. These allow many of the program facilities to be changed to personal requirements. A customised program can be saved and includes the notepads and user definable keys.
TASWORD 6128 is fully compatible with TAS-SPELL and TASPRINT. It will also read in data from Masterfile 6128. It can even be used to enter and edit your own Basic programs.
With all standard and many extra word processing facilities TASWORD 6128 is the most powerful of the TASWORDS, for the Amstrad CPC computers.

TASWORD 464-D
THE WORD PROCESSOR – WITH MAIL MERGE!

TASWORD 464-D disc £24.95

This is the new TASWORD especially developed to utilise the capabilities of the CPC 464 and 664 disc drives. The additional facilities include a larger text file size and automatic on-screen disc directories during save and load operations. A major new feature is the mail merge facility. This gives multiple prints of your standard letters, forms, etc., with each copy containing, for example, a name and address automatically taken from a disc file containing the data. This data can be entered using TASWORD 464-D, or created using the Masterfile Program Extension package. A powerful and useful conditional printing facility is included – parts of a document can be printed according to user-specified criteria. TASWORD 464-D will only run on, and is only supplied on, disc.

TAS-SPELL
THE SPELLING CHECKER

TAS-SPELL disc £16.50 for the Amstrad CPC 464 and 664 running TASWORD 464-D and for the CPC 6128 running TASWORD 6128

Spelling mistakes and typing errors spoil any document whether it is a private letter or your latest novel. With TAS-SPELL you are free to be creative in the confident knowledge that your spelling won't let you down.
TAS-SPELL checks the spelling of TASWORD 464-D and TASWORD 6128 text files. TAS-SPELL has a dictionary of well over twenty thousand words which it compares with the words in your text. If a word is not recognised then the relevant part of your text is displayed with the suspect word highlighted. You can correct the word, ignore it (it might be a name), or even add it to the TAS-SPELL dictionary.
Please note that TAS-SPELL will only work with TASWORD 464-D and TASWORD 6128.

TASWORD UPGRADES

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TASPRINT 464
THE STYLE WRITER

TASPRINT 464 cassette £9.90 disc £12.90

A must for dot-matrix print owners! Print your program output and listings in a choice of five impressive print styles. TASPRINT 464 utilises the graphics capabilities of dot-matrix printers to form, with a double pass of the printhead, output in a range of five fonts varying from the futuristic DATA-RUN to the hand-writing style of PALACE SCRIPT. TASPRINT 464 drives the dot-matrix printers listed below and can be used to print AMSWORD/TASWORD 464 text files. TASPRINT 464 gives your output originality and style. Completely compatible with the 664 and 6128.

TASWORD 464
THE WORD PROCESSOR

TASWORD 464 cassette £19.95

"There is no better justification for buying a 464 than this program"
POPULAR COMPUTING WEEKLY, NOVEMBER 1984

Your 464 becomes a professional standard word processor with TASWORD 464. Supplied complete with a comprehensive manual and a cassette which contains both the program and TASWORD 464 TUTOR. This teaches you word processing using TASWORD 464. Whether you have serious applications or simply want to learn about word processing, TASWORD 464 and the TUTOR make it easy and enjoyable.

TASCOPY 464
THE SCREEN COPIER

TASCOPY 464 cassette £9.90 disc £12.90

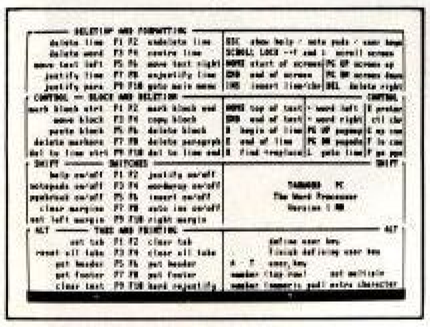
A suite of fast machine code screen copy software for the CPC 464, 664 and 6128. Print high-resolution screen copies in black and white and also large 'shaded' copies with different dot densities for the various screen colours. TASCOPY 464 also produces 'poster size' screen copies printed onto two or four sheets which can be cut and joined to make the poster.

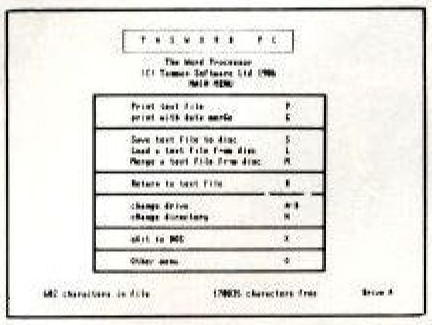
TASPRINT 464 and TASCOPY 464 drive the following dot-matrix printers:

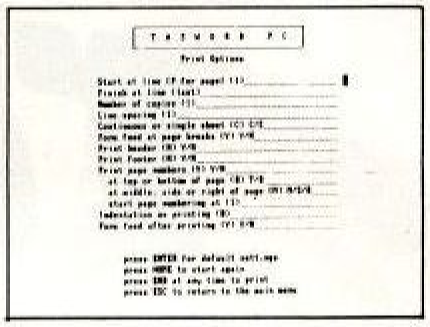
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EPSON FX-80	TALLY MT-80	BROTHER HR5	COSMOS-80
EPSON RX-80	BROTHER M1009	DATAC PANTHER	AMSTRAD DMP2000
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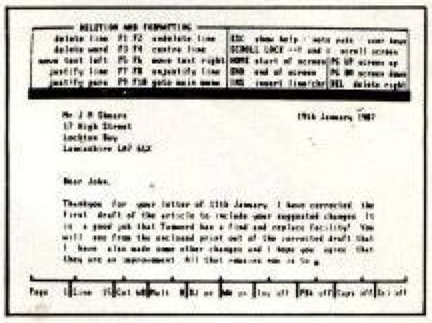
TASWORD PC

THE WORD PROCESSOR FOR THE IBM PC, THE AMSTRAD PC, AND ALL OTHER COMPATIBLES









A professional word processor at a sensible price! Send for the free brochure or send just £2 for the TASWORD PC trial disc. This trial disc is the full program except that printing and saving text is inhibited. You can type text and use all the other wide range of program features. Explore at your leisure to discover the benefits of using TASWORD PC. A voucher supplied with the trial disc is worth £1 off the price of the full program and manual.

TASWORD PC £29.95

TASWORD PC TRIAL DISC £2

TASPRINT PC

More than 20 lettering styles!

Includes font designer!

THE STYLE WRITER

A must for dot matrix printer owners! Print logos and headings, or entire documents, in a choice of more than twenty new print styles. TASPRINT PC utilises the graphics capabilities of dot matrix printers to form, with a double pass of the print head, lettering in the specified style at approximately twice the height of normal printer output. TASPRINT PC is completely compatible with TASWORD PC. It will also print text produced by other programs. In addition, TASPRINT PC includes a font designer. You can use this extra facility to create your own personalised lettering styles and logos which you can then print using Tasprint!

TASPRINT PC works with all dot matrix printers with dot graphics printing capabilities. These include:

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Amstrad	Citizen	NEC	Smith Corona
Astech	Datech	Newbury	Sord
Brother	Epson	Panasonic	Star
C. Itoh	Kaga-Taxan	Seikosha	

Send for the free brochure which illustrates all the lettering styles included with TASPRINT PC.

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COMPACTA - bold and heavy, good for emphasis
DATA RUN - A FUTURISTIC SCRIPT
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PALACE SCRIPT - a distinctive flowing font
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Tasprint output shown at reduced size

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TASPRINT PC £29.95

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rana rama

NOT since Frogger has a reptile starred in a game, now the common frog, Rana Temporara, has hopped back into the limelight. John Baker is on its trail.

It's a frog's life, isn't it? Here you are, trapped in an evil dungeon, surrounded by hordes of equally evil guardian monsters all controlled by massively evil Evil Warlocks and even eviler Necromancers. And that's a lot of evil.

And what are you? Hopping mad, that's what! There you were, Mervyn, the sorcerer's apprentice, in the boss's lab, mixing yourself a few drinks.

And what happened? A touch too much vermouth in with the eye of newt. Or maybe it was that the demon preferred his Martini shaken, instead of stirred. But the end result was that you were turned into a frog and now find yourself trapped in a labyrinth crawling with nasties.

There's only one thing for it – blast the guardian hordes, seek out the Evil Warlocks and defeat them in ritual combat. No problem, and that's your task in the latest and greatest to come from Hewson and the keyboard of Steve Turner.

Programmer pedigree

The name Steve Turner will certainly be familiar to you if you (heaven forbid) have ever had anything to do with the Spectrum.

Steve started off his games programming career in 1983, before the CPC was even a glint in Amstrad's bank account, with 3-D Space Wars – but his first major hit was probably Avalon – a superb 3D perspective arcade adventure.

The follow-up, Dragontorc, was equally successful, and the nation was once again blown away with Astro-Clone and Quazatron.

Of these five, only Dragontorc found its way on to the CPC, boo hiss, but Ranarama more than makes up for this serious omission by Hewson Inc. Quite simply, it's great.

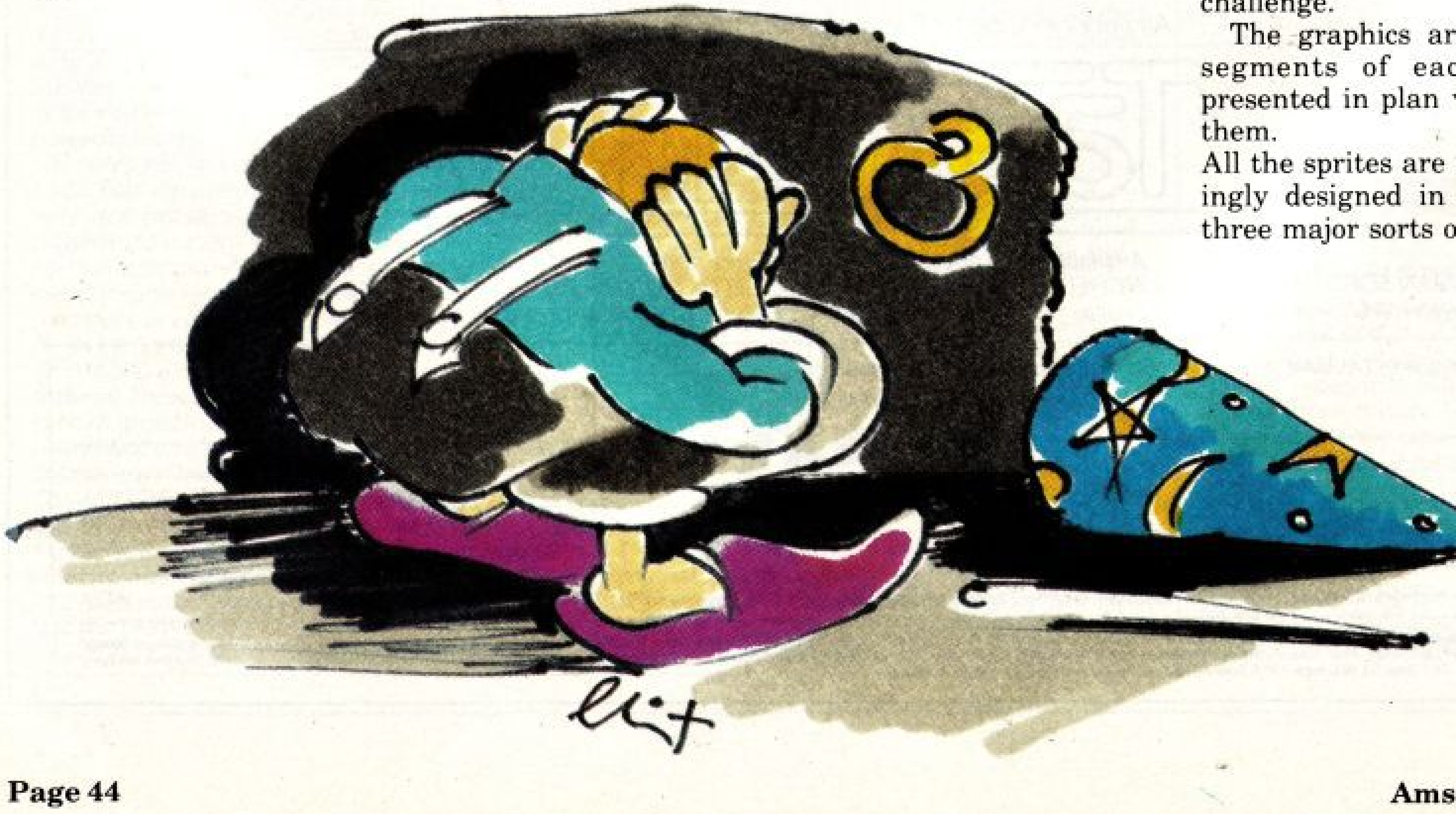
Steve Turner actually collaborates with Andrew Braybrook, arguably the most competent 64 designer/programmer around and author of hits such as Uridium and Paradroid – and, lucky us, Ranarama draws on some of its excellent elements and concepts, creating a unique mix of arcade reflexes, mental agility and downright addictiveness that is certain to make it a hit.

The toad to hell

You start stranded on the first level of the dungeon, knowing the only way out is to kill the 12 Warlocks on each level. This is quite a task, as the deeper and deeper you get into the dungeons, not only do the Warlocks get nastier and nastier, but their guardians get considerably more vicious, and considering that you start off particularly badly equipped for the romp, it's quite a challenge.

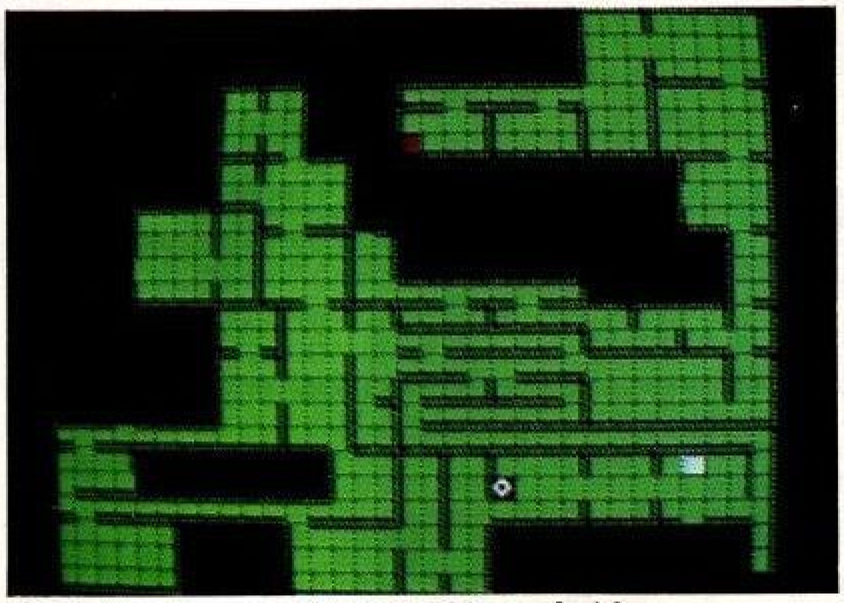
The graphics are excellent, with a segments of each dungeon level presented in plan view as you explore them.

All the sprites are animated and strikingly designed in single colour, with three major sorts of opposition.





Ritual combats – by letters


Most of Dungeon One. You're in white, and with Level Two Effect Spell, Warlocks show up in red



First you have your Magical Weapons, generated (Gauntlet-like) from tomb-like generators within certain rooms. You won't get any points for destroying their annoying creations, but you'll earn a fair 500 points from taking them out yourself.

There are four types – the Munching Mouth (although they look more like Deranged Dentures to me), the Spinning Knife, the Energy Ball and the Orbiter. Although they are worthless to shoot, ignore them at your peril, as they unerringly home in on you and cost precious energy if they make contact.

The Evil Guardian Hordes weigh in with eight varieties, each more powerful than the next.

Dwarven Warriors are annoying – but can be quickly dispatched, and Fire Gollums are little worse – but when you go down to the second level and encounter Bisects and Guardians the going gets considerably tougher.

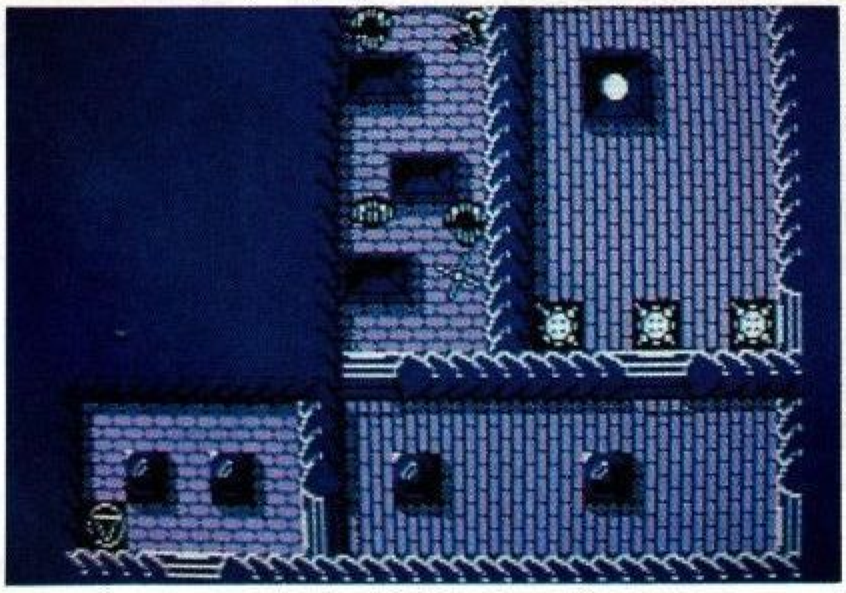
So far my encounters with Death Serpents, Ghouls and Arachnae have all been brief and when I stay alive long enough to see a Gargoyle, you'll be the first to know.

Then of course, you have your two species of Warlock, the Wizard and the awesomely powerful Necromancer. The latter are to be avoided until Mervyn has built himself up a bit.

Learning to spell

Your initial armory consists of four types of spell – Effect, Offensive, Defensive and to keep all these going, Power Spells that provide the energy to keep all these active, as well as effectively providing you with extra lives.

It works like this. You start off with a set of Level One spells, Zap – for killing

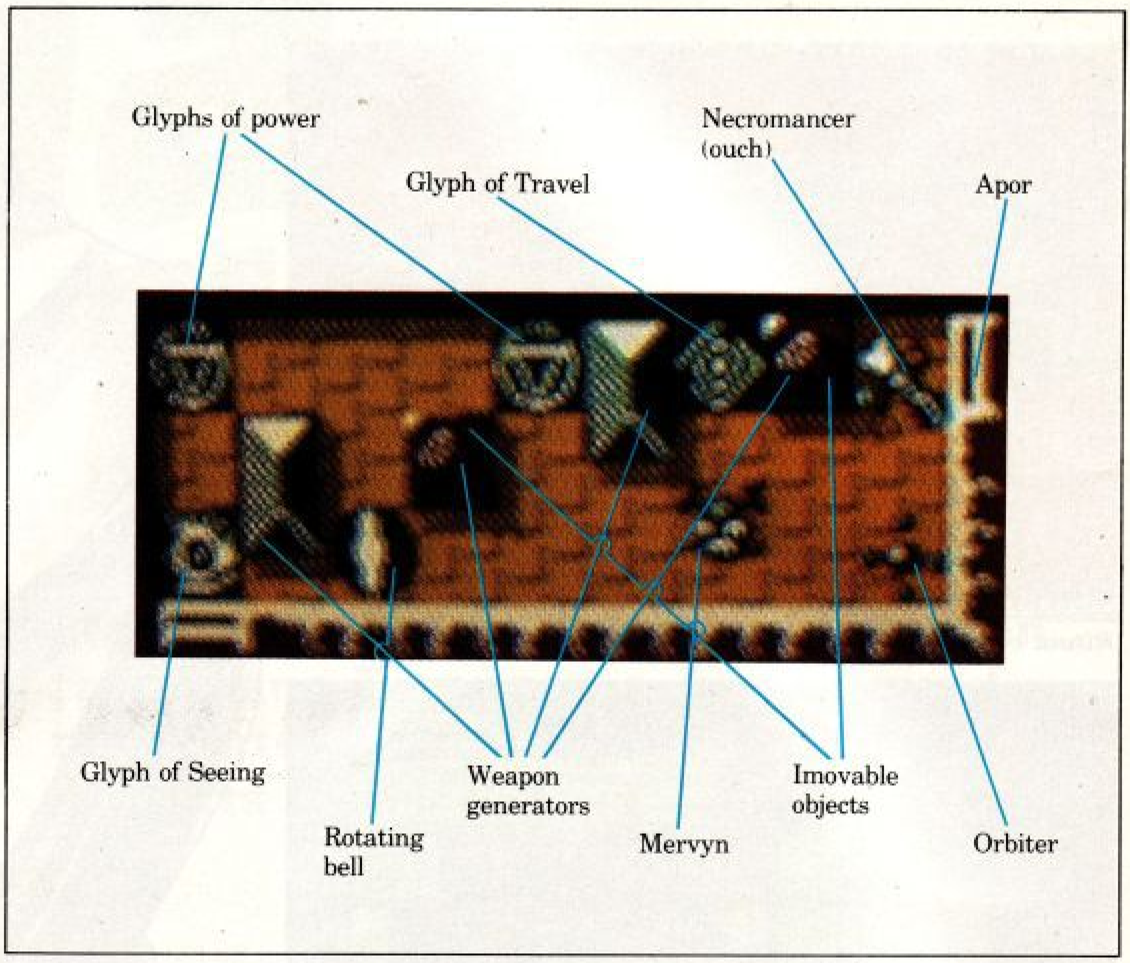

Demented Dentures strike again!

nasties, Protect – for keeping them at bay and Find, which will reveal secret doors.

Your single Level Two spell is Psychic. Problem is, when you run out of energy (deplenished by hits and time, replenished by finding Power Crystals) the spell vanishes and you're left with the Level One spell, Mortal.

Mortal means trouble. If you run out energy with Mortal, it's the big Game Over. The answer? You have to find yourself a Glyph of Sorcery – a floor tile marked with a circle within a triangle – and cast another Power spell. For which you need magical runes. Which you can only get from Warlocks. And the bad news is, they are not giving them away.

Runes, in fact, are the key to the whole game. If you have the right runes – you can cast stronger and stronger versions of each type of spell, and you'll find that these are essential in the lower levels of the dungeons, where the guardians are, err, somewhat tougher than the wimps you find on the first level.



Waging war with a warlock

To get the runes, however, you must engage the Warlocks in ritual combat – by bumping straight into him. You are now moved to a screen with the word Ranarama emblazoned on it. The computer will scramble the word up before your very eyes and to win the combat you must put them back in order before the timer (which is counting down as fast as it can go) reaches zero.

The unscrambling is done by moving a frame that highlights a pair of letters at a time left and right along the row, then pressing fire, which swaps that pair around.

Simple it is, but mind-bending when played against such a time limit. And the deeper within the complex, the greater the initial scrambling and the shorter the time. Lose and you are stripped of your current Power spell (dead if you are Mortal) and teleported to a random location on the same level.

Win and you drop into the main screen and scramble around for the runes that the defunct Warlock has dropped, which make their way to the four corners of the combat room.

As mentioned before, spell casting is done on one of the Glyphs of Sorcery (which share the mystic quality, along with taxis and policemen, of never being around when you want them), with available spells being flashed up and selected under joystick control, but there are other Glyphs that come in useful during the course of the quest.

Landing on a Glyph of Seeing (a tile looking like an eye) displays a map of the whole dungeon level, or at least the bit you have explored to date.

A Glyph of Power is a kind of smart bomb that will destroy all sentient enemies in the room, while a Glyph of Travel will take you down to a lower level . . . and sometimes back up again.

These are the bare elements, but believe me, they combine the make Ranarama one of the best games available on the CPC.

The combination of blasting, exploration, strategy and mental agility needed to get any decent way into the game will have your brain protesting at the effort involved. It's a tribute to the design that you feel it can be cracked . . . if only you have just one more go.

Nice one Steve, nice one Hewson, and if you can only conjure up the pennies for one game this month, treat yourself to Ranarama. It really is ribbit-ribbit-ribbiting stuff.

ACU



Active Spell list



Going into detail



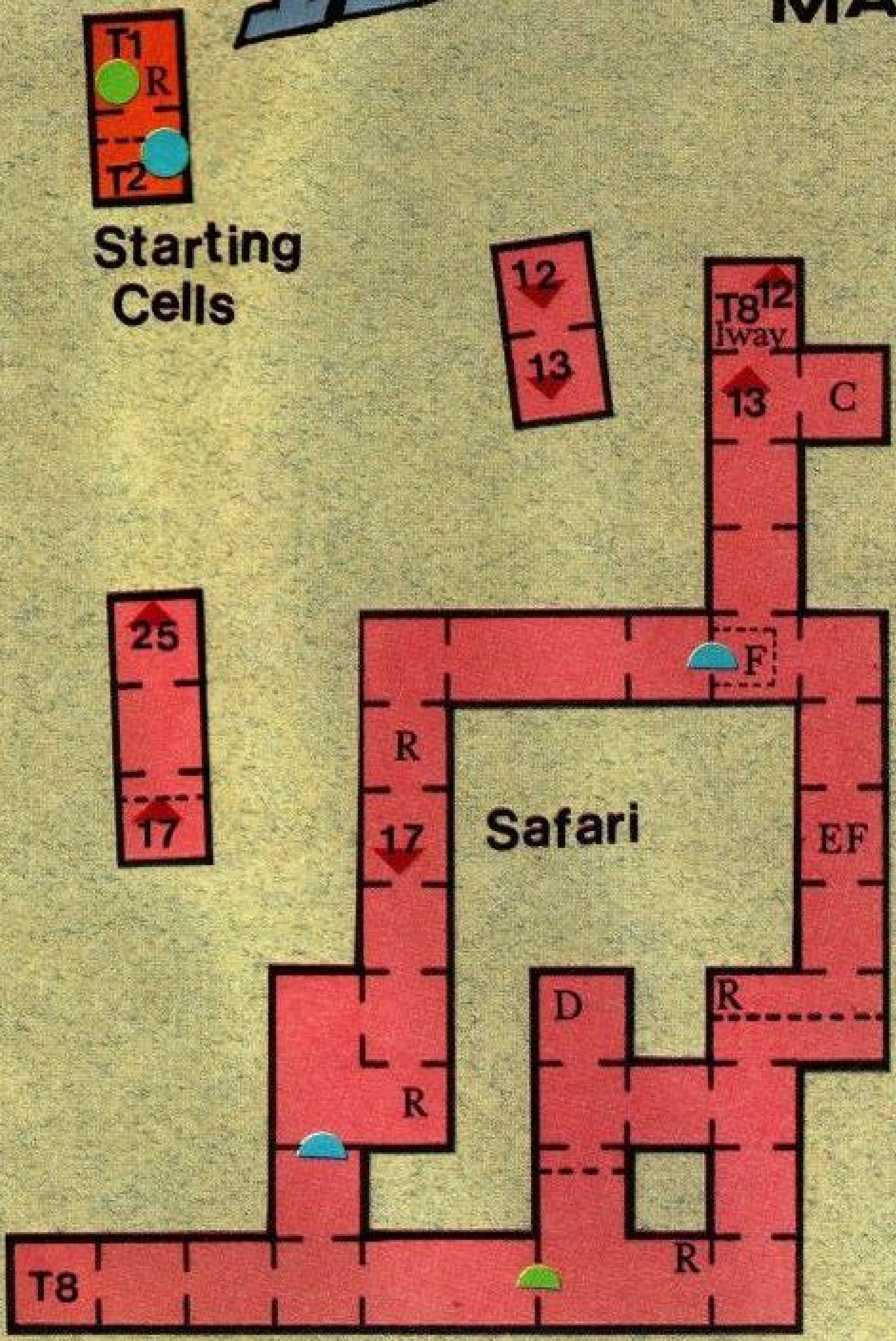
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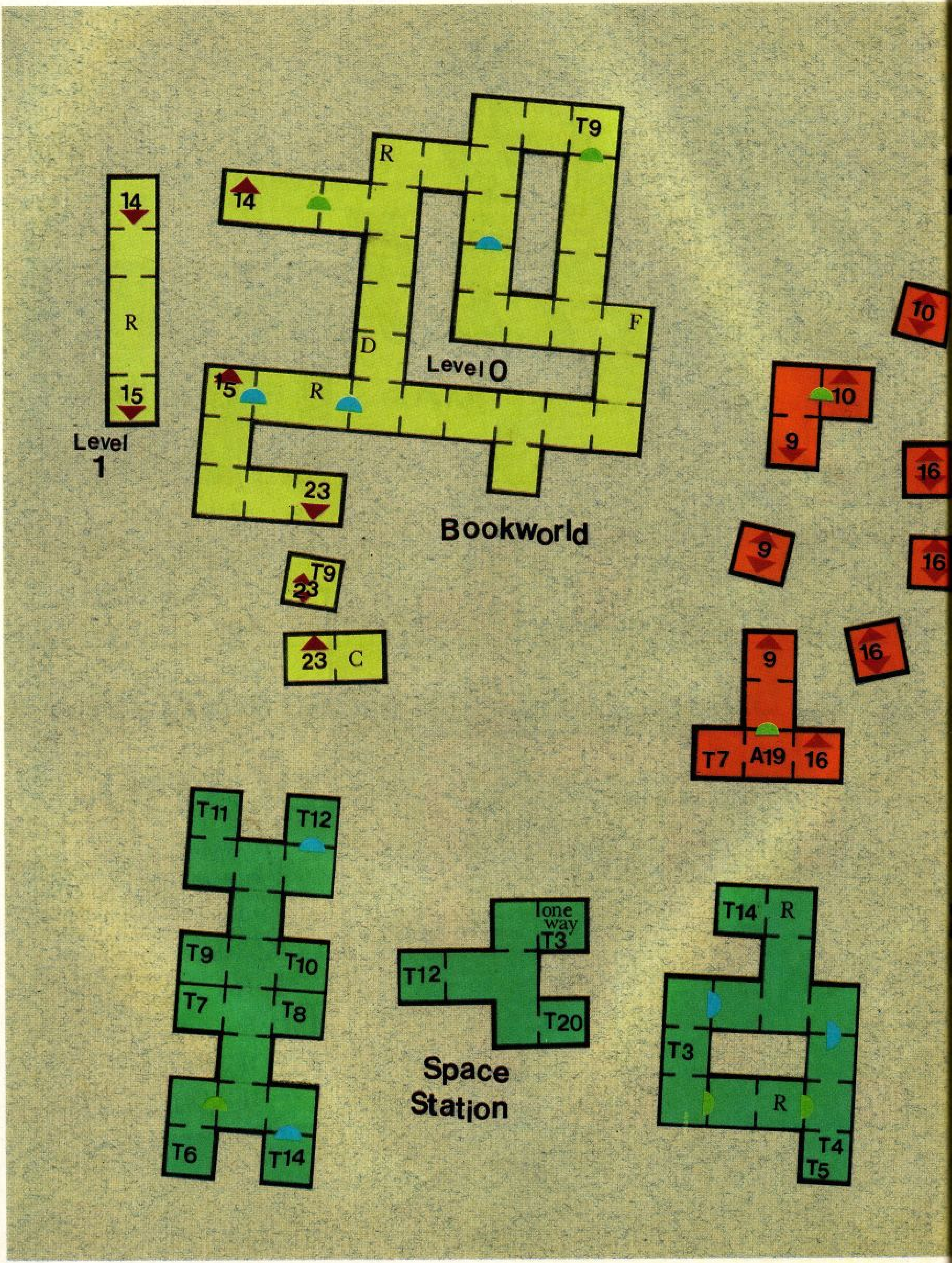
HEAD OVER HEELS THE MAP



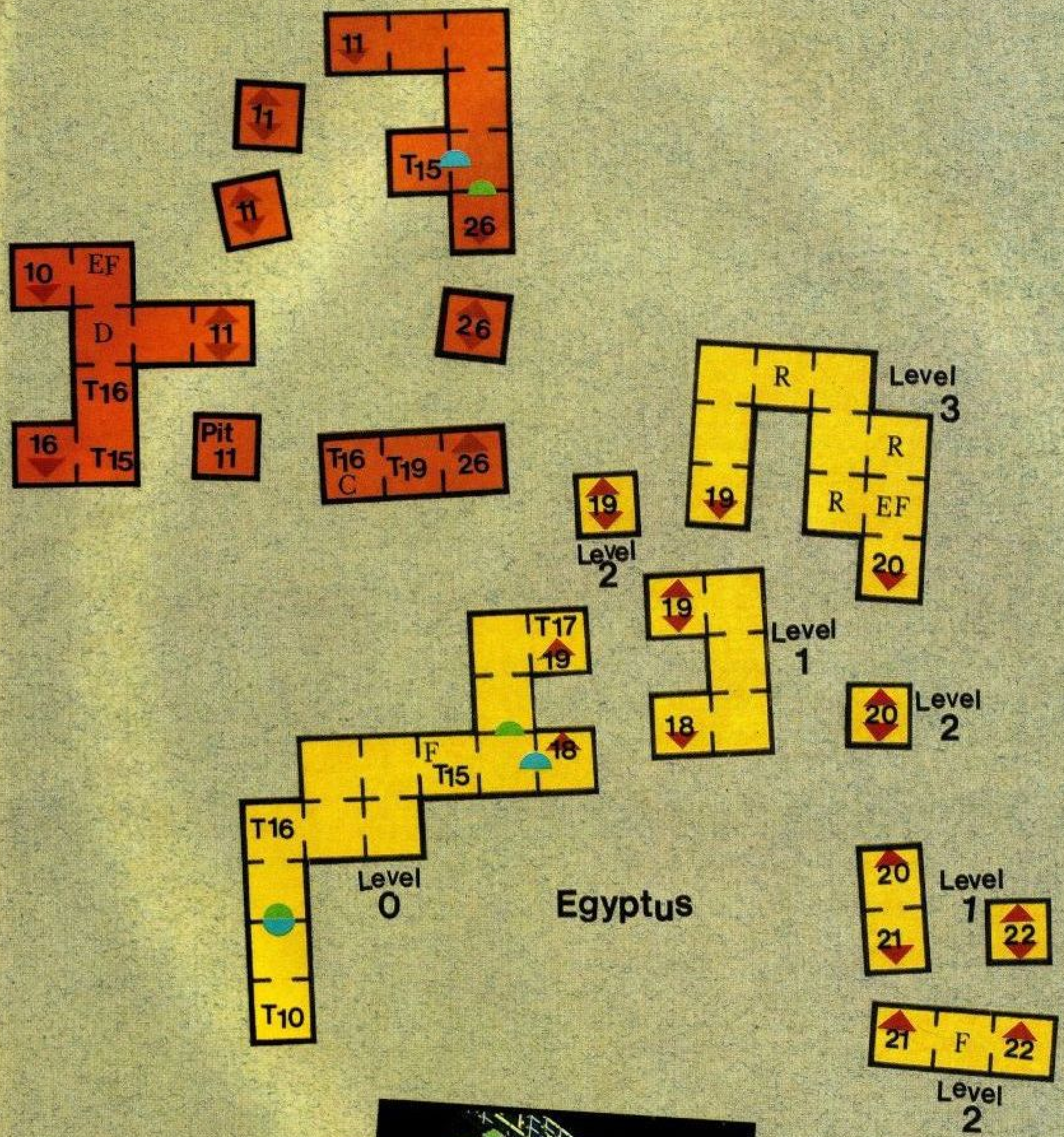


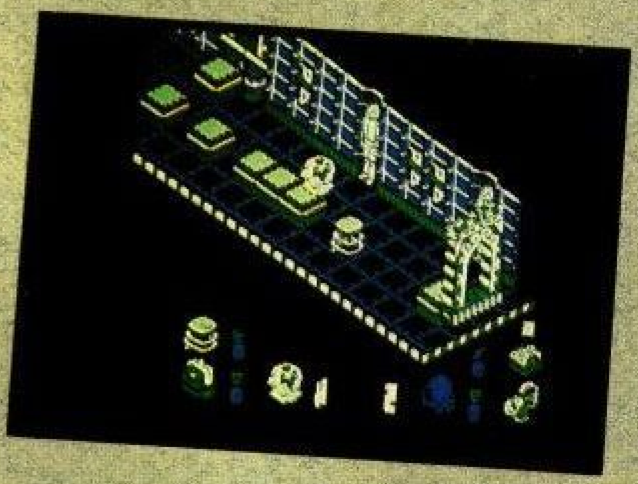
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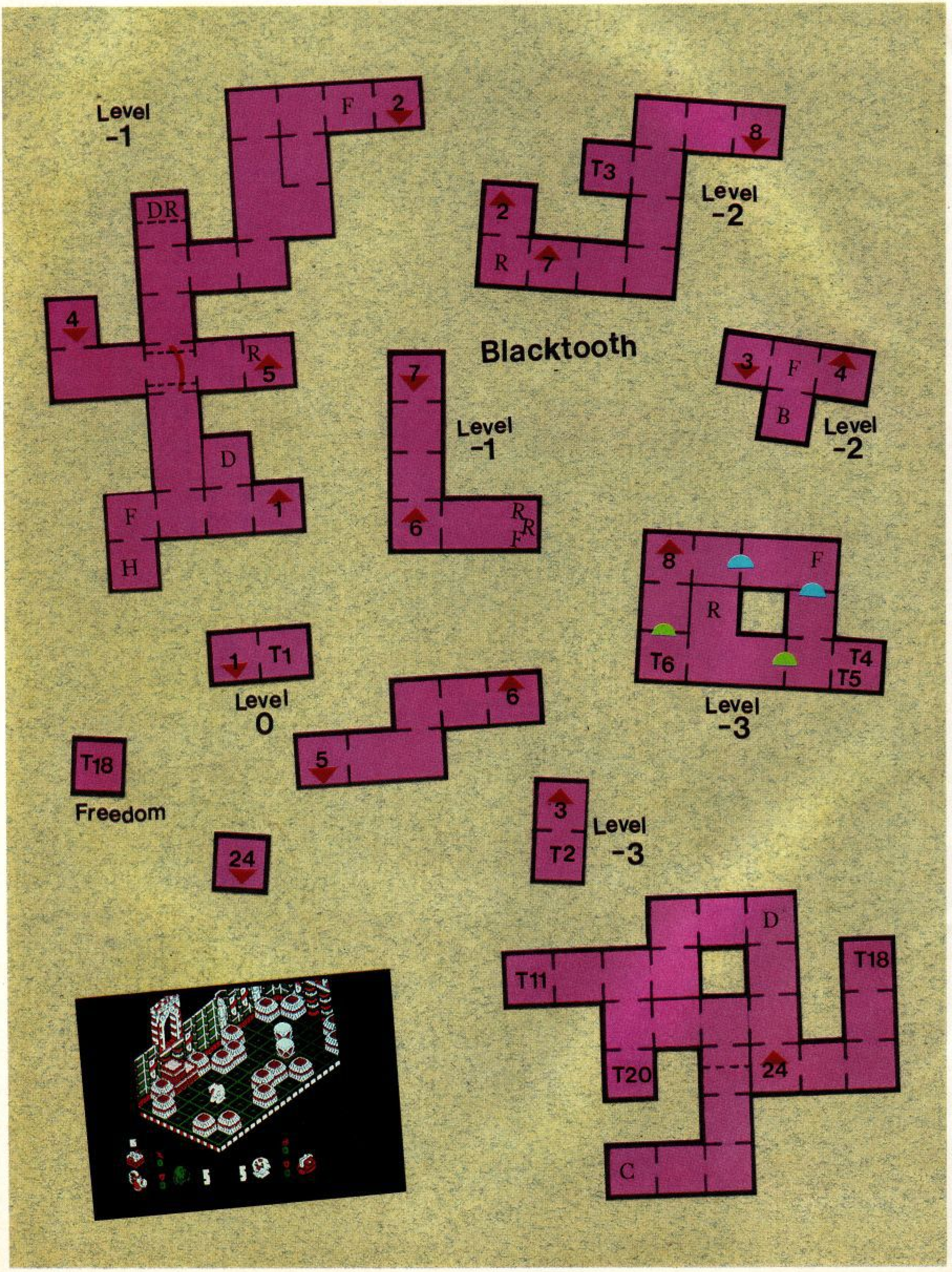
- Head Start
- Heel Start
- C › Crown
- Lifts & Drops
- T › Teleport
- H › Hooter
- D › Doughnuts
- B › Bag
- R › Rabbits
- F › Fish
- EF › Evil Fish
- › Head Only
- › Heels Only



Level 1
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MULTIFACE TWO is UNIQUE both in unbeatable value and features:

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  RETURN – to CONTINUE a program after any operation.
  JUMP – not to return but to JUMP to another address, say to your own routines in the 8K RAM extension.
  TOOL – to access MULTI TOOLKIT routines.
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- **MULTI TOOLKIT is the only existing combination of hardware and software capable of displaying & modifying EVERYTHING you may wish to know about a program and current state of computer. You can PEEK/POKE the entire AMSTRAD contents incl. extra 8K RAM, Z80 registers, colours, etc. You can open a WINDOW and scroll through 56 byte blocks in decimal, hex and even ASCII representation (ie. everything seen as text to reveal messages, etc) with full on-screen editing. You get INFO on screen mode/start address, interrupt mode, no. of characters per line, horizontal sync. position, lower and upper ROM and RAM bank status, ROM type, etc. And ALL can be changed . . .**
- COMPATIBLE with expansion ROMS, RAMS and any other devices.
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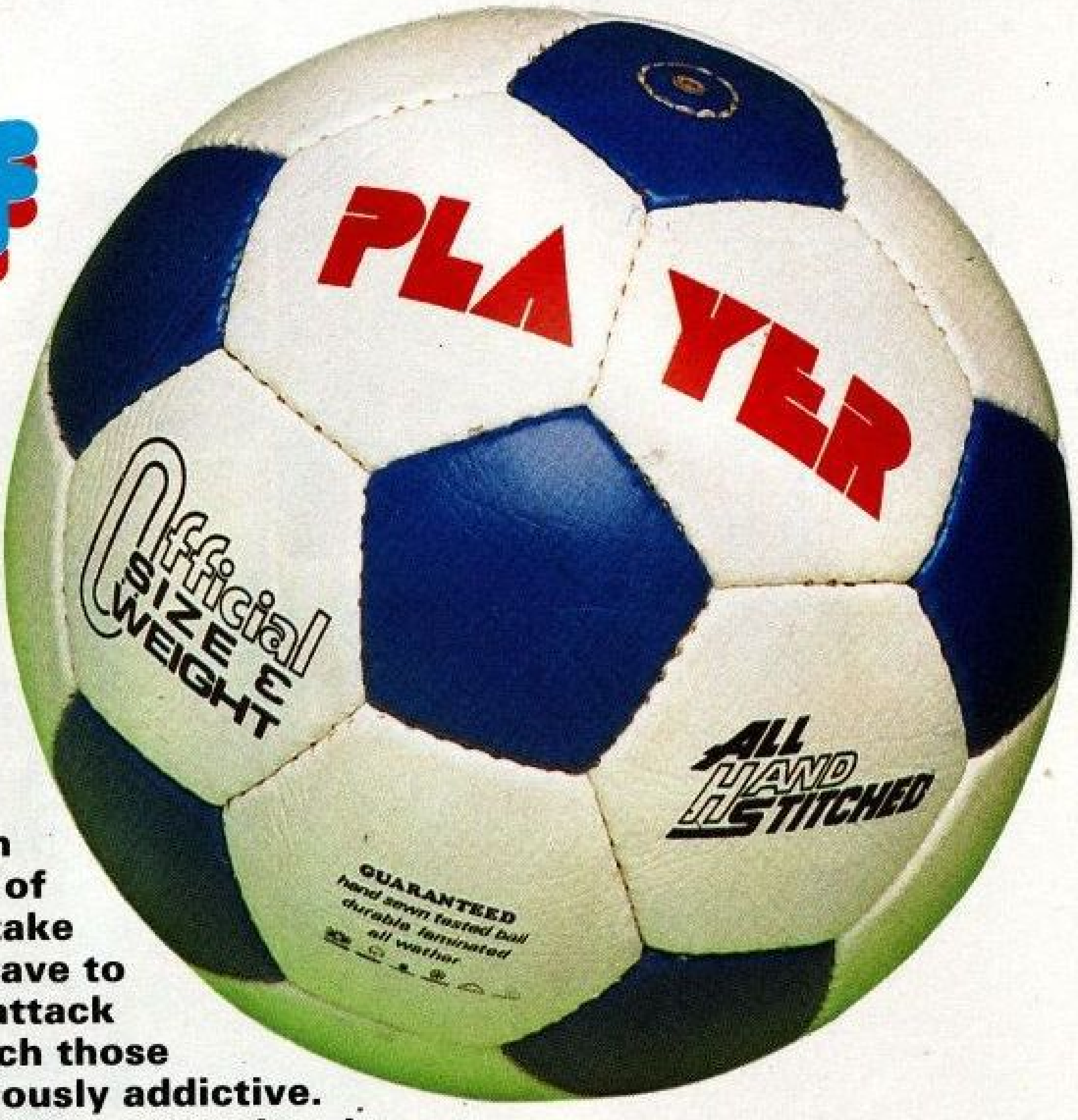
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Ten lucky readers will each win a football and a copy of Brian Clough's Football Fortunes. All you have to do is answer these questions.

A: Which team plays at Anfield?

B: Who is the manager of Nottingham Forest?

C: What colour flags do linesmen use?

1. The sender of the first 10 correct entries drawn on June 10 will win a regulation quality and weight football, plus a copy of Brian Clough's Football fortunes.

2. You may photocopy the form but only one entry is allowed per reader.

3. The judges decision is final, no employees of ACU may enter.

(program development system) they were able to get it over to the CPC in around a month. Rumour has it that most of the work took less than a week.

PDS runs on an Apricot, and Realtime only had one machine so the three worked in shifts, each taking an eight hour stint of programming and working through the night. It is this kind of dedication which produced games as amazing as the three Stargliders.

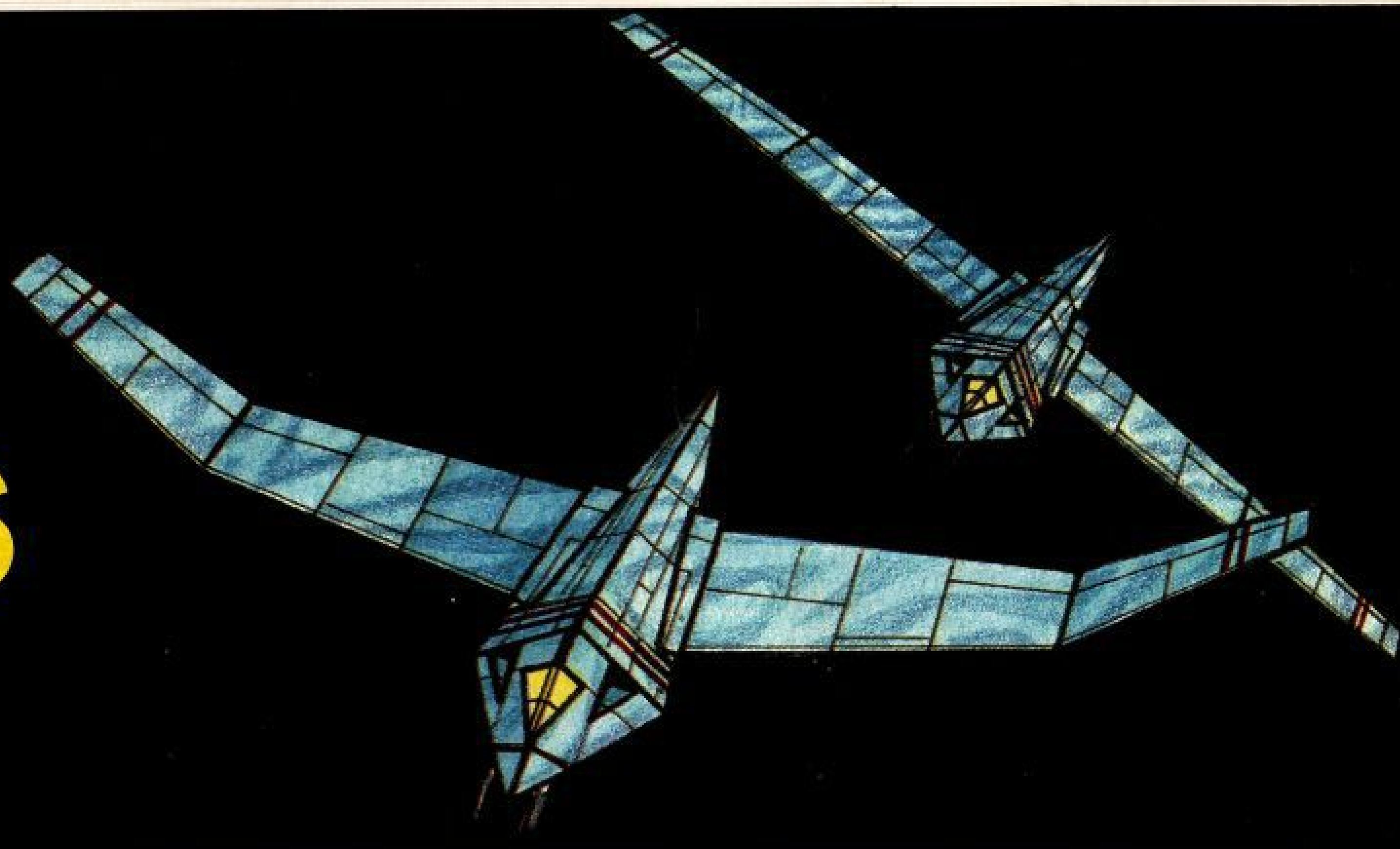
Another recruit to the Rainbird Starglider project was James Follet, author of Earthsearch and Who Dares Wins. Much of the plot for the game grew from discussions between Jim Follet and Jez San, with some assistance from Gary Shienwald and Paul Hibbard at Rainbird.

The novella was written after the



...ree ...liders

...Starglider is ... Amstrad ...ckman looks ...grace ...C1512.

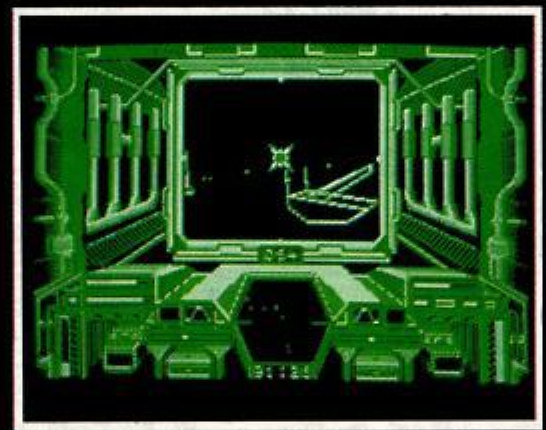


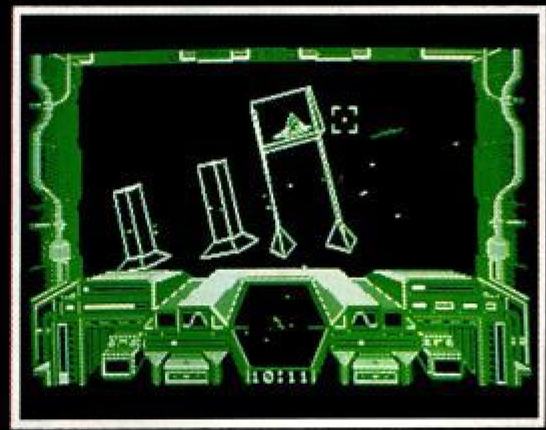
programming had been started, but early enough for some changes to be made. Ideas which were scrapped included the ability to drop pods and have a third party view, fog, duststorms and separate gun and steering controls. Some of these ideas went because of implementation reasons and some for playability, none without serious consideration.

James Follet described Jez as "the dog" and made it clear that his part was merely "the tale". In no circumstances should "The tale be allowed to wag the dog".

The plot

The planet Novenia is a peace-loving place, and to stay that way the Novenians built a protective wall in space to keep out anyone who would wish them harm. Space being what it is, there were lots of people wishing to take over the planet, not least Hermann Kruud, a kind of Darth Vader





saving their devastating power for evil foes.

Jack Tramiel once said "The Japanese are coming – we will become the Japanese". Hermann Kruud may well have studied this strategy. He became a Starglider. Or to be more accurate he built ships in the image of the birds.

Each of his horribly-beweaponed landing craft is shaped like a huge Starglider, which fly in the imperfect V formation the Sentinels are programmed to ignore.

Once on terra firma the masquerade is dropped as each ship disgorges a

ally pilot, but inside the missile, on a suicide mission with a time limit.

Fly the missile at the target before the counter reaches zero. If you miss, find another victim quickly so as not to waste a valuable missile. At the start the game you have only one of these superweapons, though more can be picked up by docking at a silo on the planet's surface.

Even then only two missiles can be carried at a time and the silo cannot manufacture them to meet your demand. Destroying Kruud's Starglider One takes three missiles (two on the first level) so don't waste

Jeremy's game and produced a stunning Spectrum version in record-

ning Spectrum version in record-breaking time. Then thanks to hard work and an assembler called PDS (program development system) they were able to get it over to the CPC in around a month. Rumour has it that most of the work took less than a week.

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The novella was written after the mann Kruud, a kind of Darth Vader character who leads the evil Egrons.

Unfortunately for the Novenians, Mr Kruud is a shade more inventive than they'd have liked. Or perhaps the Novenians were just a shade too peace-loving.

You see there was a breed of intergalactic bird which flitted from planet to planet – the Starglider. Not wishing to harm them, the Novenians ensured that the protection system would ignore the harmless creatures, is dropped as each ship disgorges a cargo of battlecraft – Walkers which drop gun emplacements, a variety of mines, Lotus starfighters, Egron tanks, Starglider drones and the dreaded Stompers.

As with any good adventure story, there's a hero and heroine ready to spring to the rescue of the universe. In a neat bit of role reversal the heroine, Katra, persuades the reluctant hero, Jaysan (note pun on J. San), to accompany her in a craft which is of historic interest and not particularly well equipped.

They then take on the Egron forces. Guess what you have to do in the game. That's right take a craft which is about as powerful as a Dakota and pit it against Hermann Kruud's 747s. Do you think you can manage that?

Flying your craft over Novenian soil you have to dodge the missile-wielding and laser-touting foe. You can shoot most craft, but the Walkers and Stompers can only be vanquished with a TV guided missile.

Press the L key and you are no longer in control of the AGAV you usu-(two on the first level) so don't waste them.

The silos which manufacture the missiles give you a chance to relax, well protected from the Egrons outside. You can learn about your enemy by interrogating the silo computer, which will detail the individual craft, giving you the edge when it comes to doing battle.

If you are battle weary the silo will do its best to patch you up, fixing the laser and shields – but it cannot refuel your AGAV. This must be done by sucking energy from the metro system.

The underground railway on Novenia is powered from clusters of three towers, grouped in isosceles triangles. By flying over the power lines which run from base to apex you can recharge the ship with induced power.

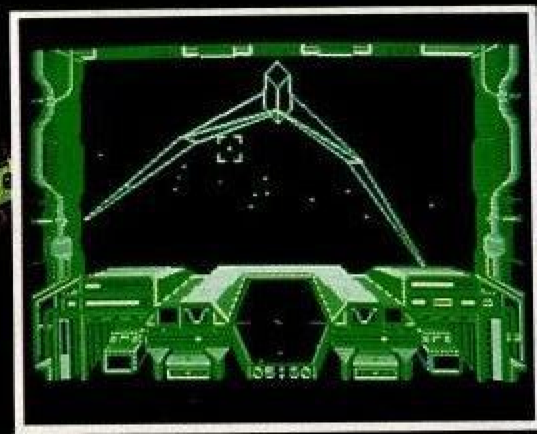
The Egrons have caught on to this and will gather around the towers, so don't let your power get too low. Remember – less haste more speed; muck up refuelling and you will meet a sticky end.

Your allies within the silos will aid and abet you in the quest to free the planet. Special mission will be offered to you, and there'll be warnings of silos being attacked by secret Egron craft such as the crawler. You'll have a chance to arm yourself with special weapons such as the super missile or a rear view scanner. Keep a pen and paper handy.



CPC

The Amstrad CPC version of Starglider was the first conversion from



Realtime's Spectrum version. The speed at which it was produced is very impressive and it has lost little in translation.

Using mode 1 gives all the shapes a smooth outline: Realtime used Mode 0 for its first Amstrad program – 3D Starstrike – but changed to mode 1 when they wrote the sequel.

I hope that the employment of the four colour mode in Starglider denotes that the men from Leeds will stick with my favourite of the four modes.

Starglider uses a technique called double buffering. This needs two screens to be held in memory; all the drawing is done on the unseen screen and then displayed once the picture is complete.

Double buffering eliminates flicker: The worst that can happen is that some of the animation will appear jerky, but it is expensive on memory.

Using some programming tricks, it is possible to shrink the Arnold's 16k screen to around 12k without losing too much of the display. Two screens then take up 24k, leaving less than 40k in which to store all the graphics, the missile screen, text, missions and the program itself. Realtime has done a fabulous job shoehorning this much game into a 464.

PCW

When Amstrads' advertising agency wrote the line "More than a word processor for less than a typewriter" I'm sure it was thinking about CP/M+ and business applications, not a 3D alien-zapping game more at home in an arcade than on the green screen.

If Amstrad doesn't think of the Joyce as an alien zapping beast then Realtime does. Rainbird has hailed the PCW version as the best 8 bit Starglider.

The high resolution of the screen has been used to give three intensities of green. The roller ram produces some spectacular tricks like a tumbling title page, and the speed is kept up to produce a very exciting program. If you only buy one game for a Joyce make this it.

Perfectionists to the last, Realtime has made sure that you will be able to use your fave peripheral with Starglider. It supports most Joystick interfaces, Kempston and AMX mice. A truly splendid bit of code.

PC 1512

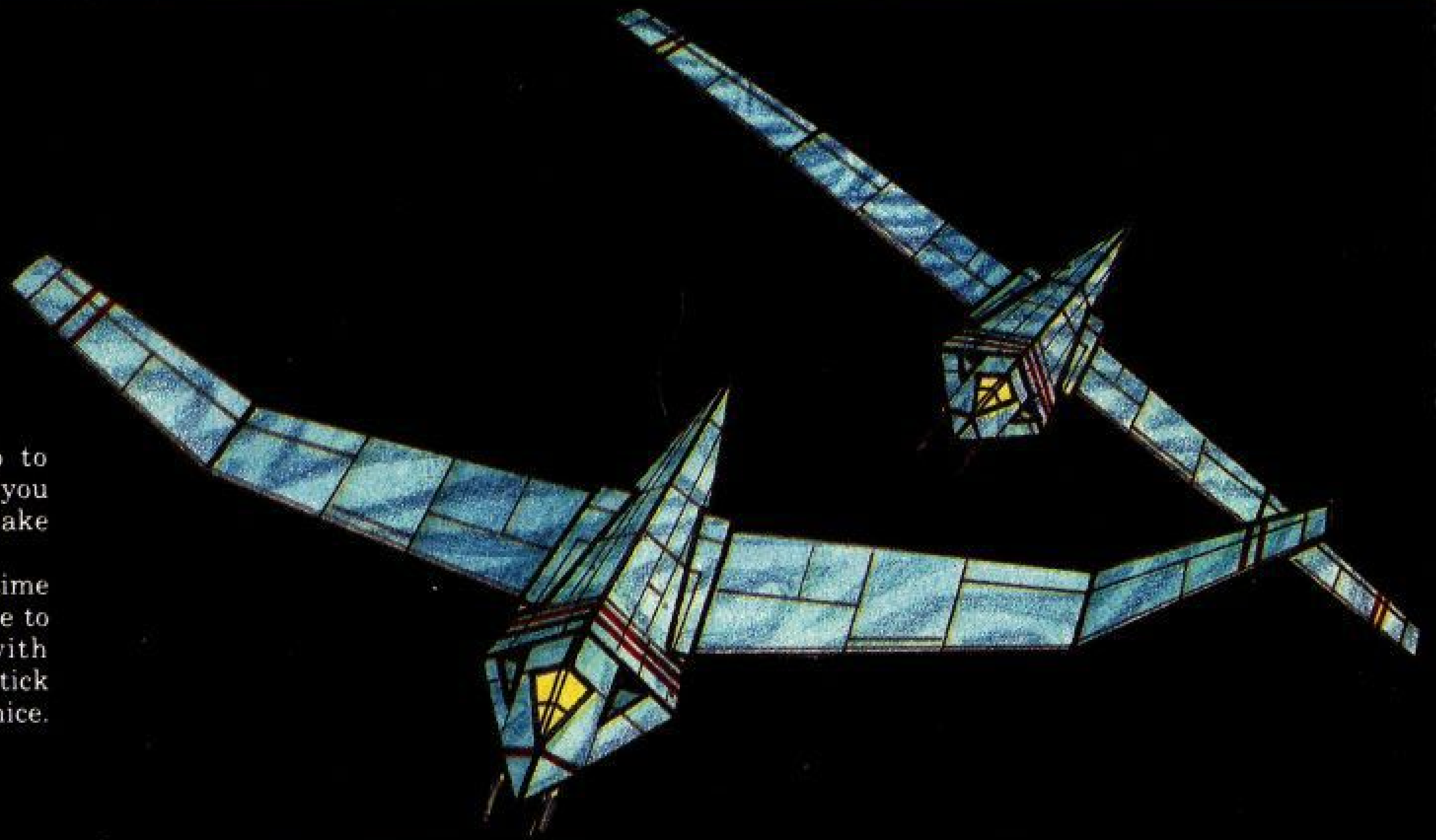
Realtime's tour de force, PC Starglider, runs on all PCs, with special routines to slow it down on exceptionally fast machines. On an Apricot Xen-i 386 it could well run so fast that you wouldn't be able to see what was happening. But they are £4,000 each, so not many people will worry about that.

On the Amstrad PC it runs beautifully. You can choose which four colours you want to display, mouse, keyboard or joystick controls and save the high scores to disc.

One of the best features of the PC version is that the disc isn't protected so you can copy the files on to your hard disc. But you do need a copy of the novella. The program asks you for a random word from the book by giving a page, paragraph, line and word reference. Get it wrong and the program won't run. Make the mistake thrice and the computer will hang up.

Starglider on the PC is very exciting and worth taking some time over. Get used to using the mouse and learn the tricks for destroying the Starglider.

When it is in the distance it will circle, but get close and the bird will flee. Follow behind and just below and launch a missile from close range, pointing up and into the Starglider.







Assuming you hit it, the view will change back to that from the AGAV. A wounded Starglider flashes – be prepared to launch the second missile. Accelerate, and once again fly below your quarry.

When you destroy the Starglider it explodes into the faces of its shape. In best World of Sport tradition you get an action replay which shows Hermann Kruud's craft biting Novenian dust.

Starglider is not cheap, but then no game for the PC is. With the excellent documentation and the enjoyable novella it makes the US imports look very expensive. Let's hope Rainbird continues in this vein.

Rainbird are on 01-240 8838

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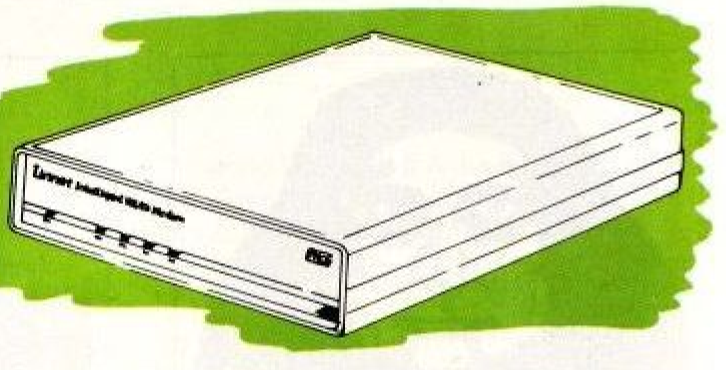
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ACU6/87

This is a Linnet An' you can winnit!



Once you have connected your computer to the telephone whole new horizons open up. If you are a serious type Amstrad user then you can use systems like Telecom Gold, MicroLink, Easylink and Prestel, to do things like communicate with electronic mail, send telexes and check on share prices. If you want to have some fun then there are hundreds of bulletin boards run by enthusiasts, or big systems like Micronet and Viewfax (parts of Prestel Microcomputing). Adventure freaks will refuse to be separated from Gods and Mud, the multi-user adventures where you can escape into a fantasy world. Really enthusiastic comms users will discover PSS and link with computers around the world.

How to win

Below you will find the names of four records, underneath there are four artists. All you need to do is draw a line to link the song with the singer. Then name one more song with the word Telephone in the title and name the singer.

Luverrly Linnet

You can't get online without the equipment. PC users will need some software. PCW users will need a serial interface and CPC users will need both, but everyone will need a modem. The Pace Linnet is just the job. It can be used at either 300 Baud full duplex or 1200/75 Baud. This means that it can be used to contact both simple bulletin boards and big systems like Prestel. You don't even need to worry about setting the speed since the Linnet can listen to the phone line and automatically adjust. If the number is engaged or unobtainable the modem will recognise the tone.

The Linnet is Hayes compatible; this is the major standard for modems and so most software will be able to work in conjunction with the Linnet. Perhaps the most important aspect to this is auto-dialling, by simply sending a string of commands to the modem it will dial the number. The Linnet can store your favourite numbers in its own memory allowing you to send a short code.

In fact the Linnet is so good that Amstrad has chosen a special version to be sold as the Amstrad modem which fits inside the PC 1512. For a Hayes compatible, multi-speed, intelligent modem the Linnet is very cheap. Pace will sell you one for around £160. Three *Amstrad User* readers will win one and pay only the price of a stamp.

Hanging on the telephone — Telephone Man — Telephone Line — The Telephone Always Rings

Fun Boy Three — ELO — Mary Wilson — Blondie

My Telephone Song: ______

Singer: ______

Name: ______

Address: ______

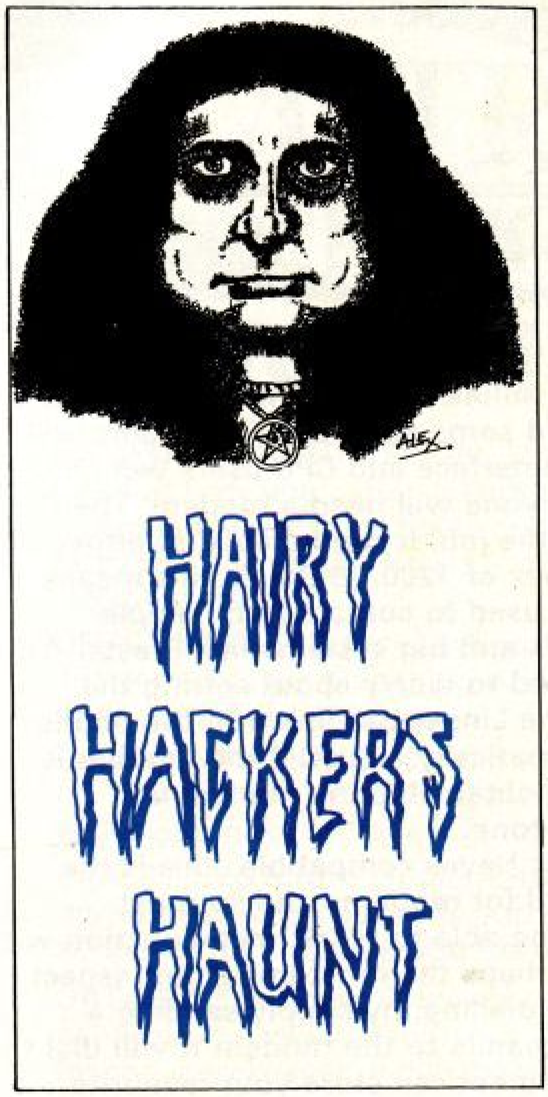
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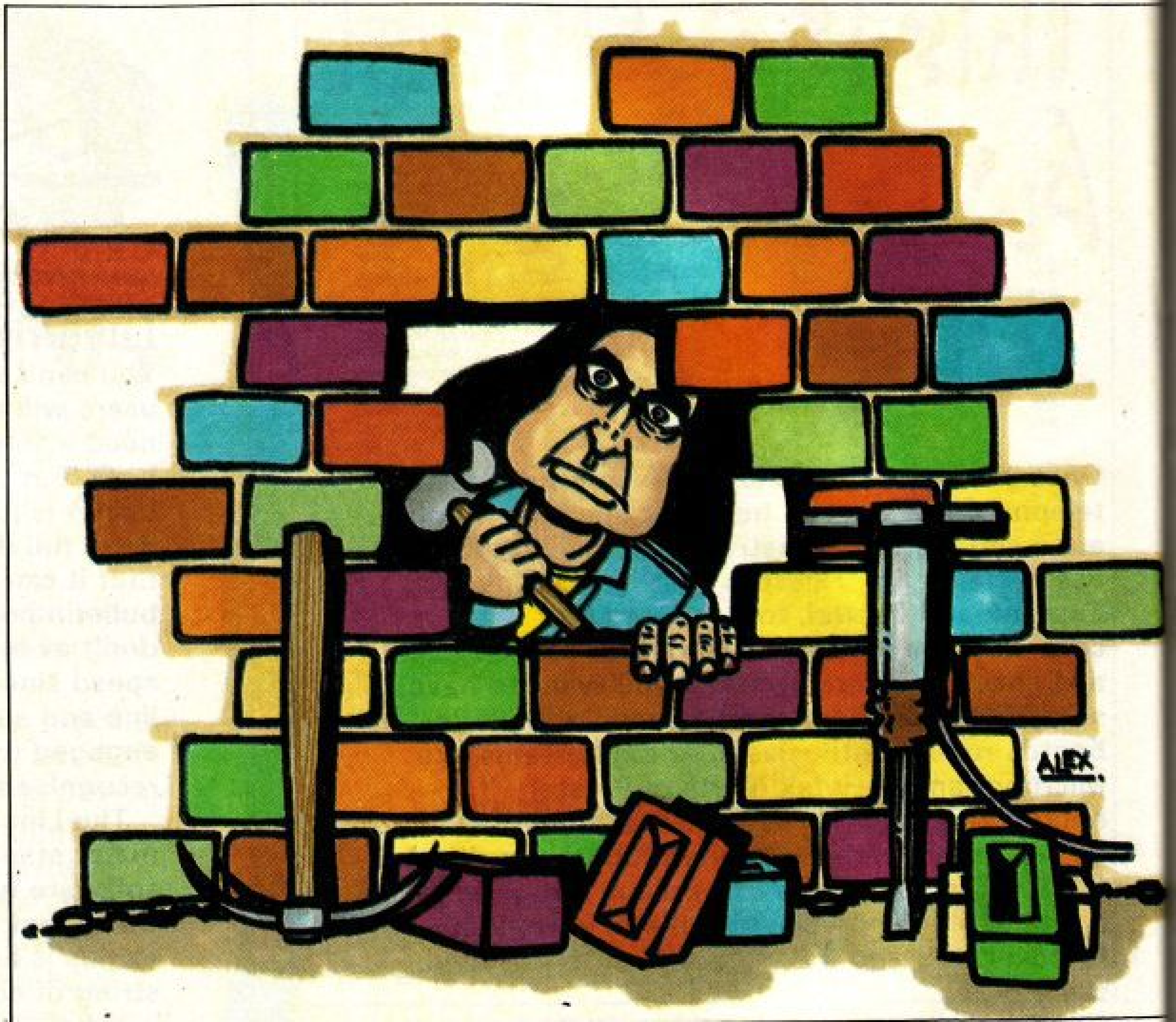
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Rules

1. *The winners will be the senders of the first, second and third correct entries drawn on June 10.*
2. *You may photocopy the form but only one entry is allowed per person (be honest now).*
3. *The judges' decision is final, no employees of ACU may enter.*

Send your entry to:
Pace Modem Competition,
Amstrad Computer User,
169 Kings Road, Brentwood,
Essex CM14 4EF.





Vax breaks out

He makes cheating easy... Vax's pokes are pretty sleazey

Oyez! Another Hairy Hackers hits the vaned centrifugal cooling unit. Not much work for The Hairy One to do this month, you lot have been exceptional with your postal efforts, which has to be good news for all yous readers out there. Let's try and keep it that way – a free game chosen at random from Lance Davis' goodie bag for every poke used.

We're a bit short this month, due to yours truly and wife taking a wee break in The Gambia (that's Africa). I thought of you all, as I lay by the pool in tropical sunshine, drinking cooled firewater out of half a coconut shell with a small tropical rain-forest growing out of the top of it. Some of the monkeys looked very familiar . . .

Back in Blighty, the stalwart Steward (call me Bertrand) Russell is back again, but hardly with a vengeance (which he can't spell!). He tells me that vengeances can't stand the Scottish weather. Instead, he has a poke for Hi-rise, a game that would be much better if 'twere a mite easier. He encloses two mites: Infinite lives (boring) and four glue patches.

These pokes work on the re-released

```
5 'Hirise pokes by Stuart Russell
10 MODE 1:OPENOUT "D":MEMORY &10AF:CLOSEOUT
20 FOR S=&C000 TO &C010:READ A$:POKE S,VAL("&"+A$):NEXT S
30 LOAD"!HIRISE.BIN",&10B0
40 POKE &397D,0:'Infinite lives
50 POKE &3D96,24:POKE &3824,4:POKE &3DD0,4:' 4 Glue Patches
60 CALL &C000
70 DATA 01,50,47,11,B0,00,21,B0,10,ED,B0,C3,C4,27,58,43,52
```

version (being flogged at £1.99), but probably work on the original version, and maybe on disc too. Let me know if ye find oot.

Why did he say "four patches"? Well, the game can't take more than 4, or it gets stuck up and throws a wabbler (that's how he spelt it). In fact, the glue patch thing is a bit of a jammy one: It occasionally induces a negative stability element into the operation of the program. (Trans: It crashes sometimes.)

If you're one of the unlucky people who always get the crash, just leave out the line with those pokes in it. SNYK. That's Big Blue speak for So Now You Know.

Stuart has also succeeded in putting Dynamite Dan on disc. Method is forbidden by the Ed, and goes in the Big Black File until the revolution comes. He called the loader "DAN", and says that his computer room has now become a RUN"DAN area. Uuuurgh! Almost as bad as Vogon poetry.

I will now let Stuart make a quick plug: RS232. Next!

Some of yous read the complicated bits, though not all of you are willing to admit it. Someone in Murieston Gardens, Livingston did, and sent thanks back with two pokettes attached.

The first one is for Spannerman, an oldie which I don't think I've published

before. Any rate, it gives the second person singular/plural infinite lives/air:

```
10 REM SPANNERMAN
20 MODE 1
30 MEMORY &4000
40 LOAD "SPANNER1"
50 POKE &64D4,0
60 POKE &6C24,0
70 POKE &6C25,0
80 CALL 31774
```

The second pokeykin, apparently done with the help of a small furry creature frae Glesga, is a heap big life poke for 3D Quasars. Stick at it long enough, and you'll discover that you were never meant to score 999,999,999 trillion points. A white dot thingy comes straight for you, which you can't shoot. Anyway, 'ere 'tis:

```
10 REM 3D QUASARS INFINITE LIVES
20 MODE 1
30 MEMORY &3FFF
40 FOR N=&BE10 TO &BE23
50 READ A$:POKE N,VAL("&"+A$)
60 NEXT
70 CALL &BE10
80 DATA 21,00,40,11,80,59,3E,3C,CD,A1
90 DATA BC,3E,A7,32,DC,47,C3,00,7C,00
```

Now Justin gets in on the act with infinite bombs/energy for disc Glider Rider. This, for the uninitiated, is the program with "infinite bombs/energy for disc Glider Rider" at the top of it.

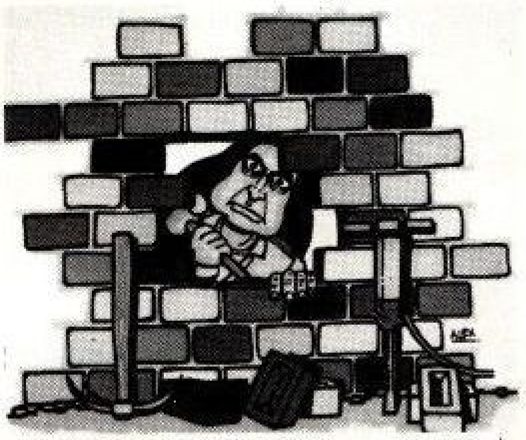
Insert the disc into your LEFT ear and run the routine.

```
5 REM infinite bombs/energy for disc
glider rider
10 MODE 1:OPENOUT "d":MEMORY &3FF
20 LOAD "glider",&400
30 POKE &1302,0
40 POKE &130D,0
50 POKE &12D8,0
60 CALL &400
```

Right, Mr. Matthew Pollard of Knutsford, I've seen your Moonbuggy poke somewhere before. But, and lucky you, your Xcel poke is excellent. Lucky readers. Yur 'tiz:

```
1 'XCEL
2 'by M. Pollard
3 'Amstrad Computer User 1987
4 '(C)opyright, so do not copy it !
10 MEMORY &8FFF:LOAD "!xcel"
20 50/1 &901E,&C9
30 CALL &9000
40 POKE &3227,0
50 POKE &3228,&BE 55 FOR p=&BE00 TO
&BE07
60 READ a$
65 POKE p,VAL("&"+a$)
70 NEXT:CALL &3000
85 DATA 3E,00,32,A4
95 DATA 33,C3,5D,6A
```

Most of you by now know how to load this sort of thing. For those of you who



don't, press the keys on the keyboard *in the same order* as they appear on the paper. Rewind tape, run the proggy, and press PLAY.

For his noble efforts, above and beyond the call of "stop messing around with that computer, and come to bed", Matthew gets . . . Poke of the Month !

Tell us what games you like, and whether you're disc-bound or not, and we'll try to get you one.

Matthew is a busy lad; There's still two more Pollard Pokettes to come, the first one up to the 'ocky is Into Oblivion. Load it, run it, follow instructions.

```
1 'Into Oblivion Poke
10 MEMORY 4999
20 LOAD "IO",5000
30 POKE &3232,0
40 CALL 5003
```

I said two, and here's the second. It's for the Computer Hits 2 version of Mutant Monty:

```
1 'Mutant Monty
5 LOAD "!CODE",8192
20 POKE 38465,0:POKE 41322,0
30 CALL 42910
```

I dunno whether it works on that version, but if you type in your name as "I want to cheat", you used to get away with it. Thanks a bundle, Matthew. Can't wait for the next pile of pokes.

Meanwhiles, back on the home front, miffed by the quality of her feed, my largest cat (Big Sol) has once more proved that she is a better defoliant than Agent Orange. Several dead monsteras and a shredded amaryllis testify to the fact. This is only of interest due to the fact that small particles of amaryllis keep settling on the keyboard, and clog it.

David Mooney (yes, that was supposed to be an M) of Old Earswax (sorry, more amaryllis. Read "Earswick") says: "I remember you did a poke for the tape version *[of Rambo]* recently, so here's hoping you have adapted it for tape." Eh? The helicopter is due North, by the way.

Another previous contributor has felt the need to write in again, and let's hope it's catching, to answer my plea for JSW and Manic Miner pokes. Normally these drive me up the wall, but someone ages back asked for some for the four pack version and Paul Russell came up with these:

```
10 REM *** CPC Four pack disc - Jet set
willy ***
20 REM *** Paul Russell 87 ***
30 MEMORY &1FFF:LOAD "jet2",&3100:LOAD
"jet3",&7100
40 POKE 36174,&49:POKE 36175,&B6:REM ***
464 owners leave this line out ***
50 POKE &81EF,&3E:POKE &81F0,80:REM ***
Lives ***
60 POKE &825D,&3E:POKE &825E,81:REM ***
Start screen ***
70 POKE &82A8,0:REM *** Infinite lives
***
80 POKE &8D86,&C9:REM *** Wot no sprites
***
90 RUN "jet1
```

He's also sent in the Manic Miner stuffs. Of which, more shortly:

```
10 REM *** Mega-huge program by Paul
Russell ***
20 MEMORY 4999:LOAD "MANIC",&FF0:POKE
&2DA9,0:CALL &FF0
```

Thanks Paul, pat on head and a few "Jolly Rodger" disc labels on their way to you.

Ha, another letter from Murieston Gardens; the guy's name is Owen Cunningham. Well, matey, we've seen all those pokes before, but nice try anyway. In case I've got it wrong, the pokes were for Doors of Doom, Roland Ahoy (which always crashed on me anyway), Oh Mummy and Mr. Freeze. Pipe up if there are any there I haven't printed yet.

Who wants another Justin special eh? Well, tough. Have this instead:

Cassette version (the rest is obvious, but in case a scalpel hits it between here and there, it's for Curse of Sherwood.)

```
5 REM Curse of Sherwood. Infinite lives
10 MODE 1:OPENOUT "d":MEMORY &4FF
20 LOAD "c.o.s.2",&500
30 POKE &5888,0
40 FOR n=&BE00 TO &BE0E
50 READ a$:POKE n,VAL("&"+a$)
60 NEXT n
70 CALL &BE00
80 DATA f3,21,bc,9d,11,e0,ab,01
90 DATA bc,98,ed,b8,c3,0a,aa,4a
```

PASTE, for those of you who weren't awake/were under the influence/can't remember anything/didn't speak English at the time (delete where not applicable) means that well-known phrase: "Rewind the tape to start and run this routine."

I used to be a hopeless games-player. But now, thanks to New Improved Justin, I can have unbounded carelessness for Nemesis.

Infinite lives are no good for this game, but this little baby takes out the

collision detection and makes the game a lot more fun.

Either rewind to start or skip first file and run routine.

Because of serious memory limitations there isn't much room left, once the routine's been typed, to actually load the game. Therefore I would not suggest you add any REMS that will increase its length. Lines 20-80 can be removed but the game won't sound the same I'm afraid.

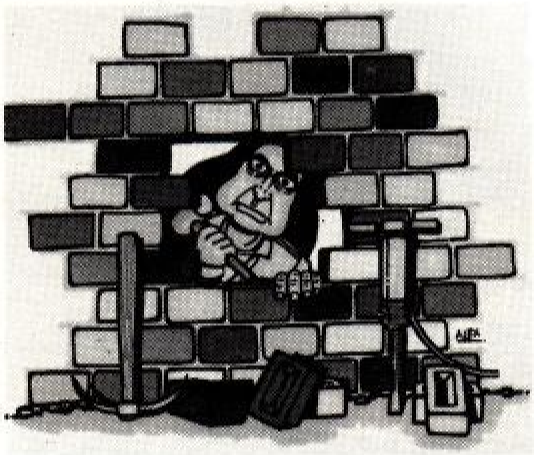
```
10 OPENOUT "d":MEMORY 999
20 ENT -1,1,9,1:ENT -3,2,-6,1,2,6,1
30 ENT -5,1,-2,1:ENV 1,2,-1,2
40 ENV 3,2,3,1,3,2,1:ENV 5,2,-1,1
50 ENV 7,10,-1,5,30,0,1,10,1,10
60 ENT -7,2,-1,1,2,1,1,5,0,2
70 ENV 8,2,2,2,5,-1,2,1,-7,5
80 ENT -8,5,0,1,2,-1,1,2,1,1
90 MODE 1:BORDER 0
100 FOR t=0 TO 3:READ a:INK t,a:NEXT t
110 LOAD"!nemsis",49152:LOAD
"!nemcode",1000
120 FOR n=&BE00 TO &BE1B
130 READ a$:POKE n,VAL("&"+a$)
140 NEXT n
150 CALL &BE00
160 DATA 0,9,11,23
170 DATA 21,26,02,01,b0,01,36,00
180 DATA 23,0b,78,b1,20,f8,21,00
190 DATA 00,22,a3,9b,7d,32,a5,9b
200 DATA c3,c5,95,4a
```

It has come to my 'airy attention, that E.S.P. (of lightpen fame) is flogging off a proggy for the PC1512 that dumps Gem pictures to a printer in shades of grey. Very clever.

To achieve the same effect for free, run your Gem from MS Dos, and type GRAPHICS /R before starting Gem off your blue disc. OUTPUT your picture to the screen, and press [shift][PrtSc]. One shaded screen dump.

All you Kung Foo (the ancient art of eating noodles with chopsticks) fans out there will plobably be waiting for a Shao Lins Road poke. Well, just in case you are, cop this. Note the contradiction in line 80:

```
5 REM Infinite lives for Shao Lins Road
10 MODE 1:MEMORY 12345
20 LOAD ""
30 tot=0
40 FOR n=&BE00 TO &BE41
50 READ a$:a=VAL("&"+a$)
60 POKE n,a:tot=tot+a
70 NEXT n
80 IF tot<>6416 THEN PRINT "Please check
me. I'm wrong !.":END
90 CALL &BE21
100 DATA dd,21,00,bf,11,3b,00,cd
110 DATA 4e,bc,21,35,be,22,39,bf
120 DATA c3,00,bf,3e,d0,21,3f,ad
130 DATA 32,00,02,22,01,02,f3,f1
140 DATA c9,3e,c3,32,e2,39,21,13
150 DATA be,22,e3,39,21,ff,ab,11
160 DATA 40,00,c3,af,39,97,6f,65
170 DATA 32,10,1b,22,15,1b,c3,f0
180 DATA 03,4a
```



Instead of typing in RUN NEWNAME, or whatever to run disc programs, type the name; hit [Shift] [Up Cursor] and [Control][Enter]. This puts RUN" in front of the filename and hits return for you. Neat, but is it worth the bother ?

Now, Ballbreaker – it's a PASTE job when you get round to running it. Note that by hitting the frogs in the game you will jump to the next level. I've got absolutely no idea why it does it, but jolly handy it is. A change to the text in line 80 might have been made by the Ed but I did think it was appropriate . .

```
5 REM Infinite everythings on
Ballbreaker
10 MODE 1:MEMORY 12345
20 LOAD "a"
30 tot=0
40 FOR n=&BE00 TO &BE18
50 READ a$:a=VAL("&"+a$)
60 POKE n,a:tot=tot+a
70 NEXT n
80 IF tot<>2493 THEN PRINT "The data
isn't correct.":END
90 CALL &BE00
100 DATA 21,09,be,22,c6,75,c3,30
110 DATA 75,97,6f,65,32,bd,1e,22
120 DATA d6,28,22,e1,28,c3,40,00
130 DATA 4a
```

We're getting near the end now, and the next one is Legend of Kage. I haven't played this one yet. Must borrow it from Justin...*(don't bother – Ed)*.

```
5 REM infinite lives for legend of kage
10 MODE 1:MEMORY 12345
20 LOAD ""
30 tot=0
40 FOR n=&BE00 TO &BE3C
50 READ a$:a=VAL("&"+a$)
60 POKE n,a:tot=tot+a
70 NEXT n
80 IF tot<>5924 THEN PRINT "Oh dear,
there's an error in the data.":END
90 CALL &BE1B
100 DATA dd,21,00,bf,11,4f,00,cd
110 DATA 4e,bc,21,13,be,22,4d,bf
120 DATA c3,00,bf,3e,18,32,48,39
130 DATA c3,00,08,21,2f,be,3e,c3
140 DATA 32,e2,39,22,e3,39,21,ff
150 DATA ab,11,40,00,c3,af,39,3e
160 DATA a8,21,67,e5,32,00,02,22
170 DATA 01,02,f3,f1,c9
```

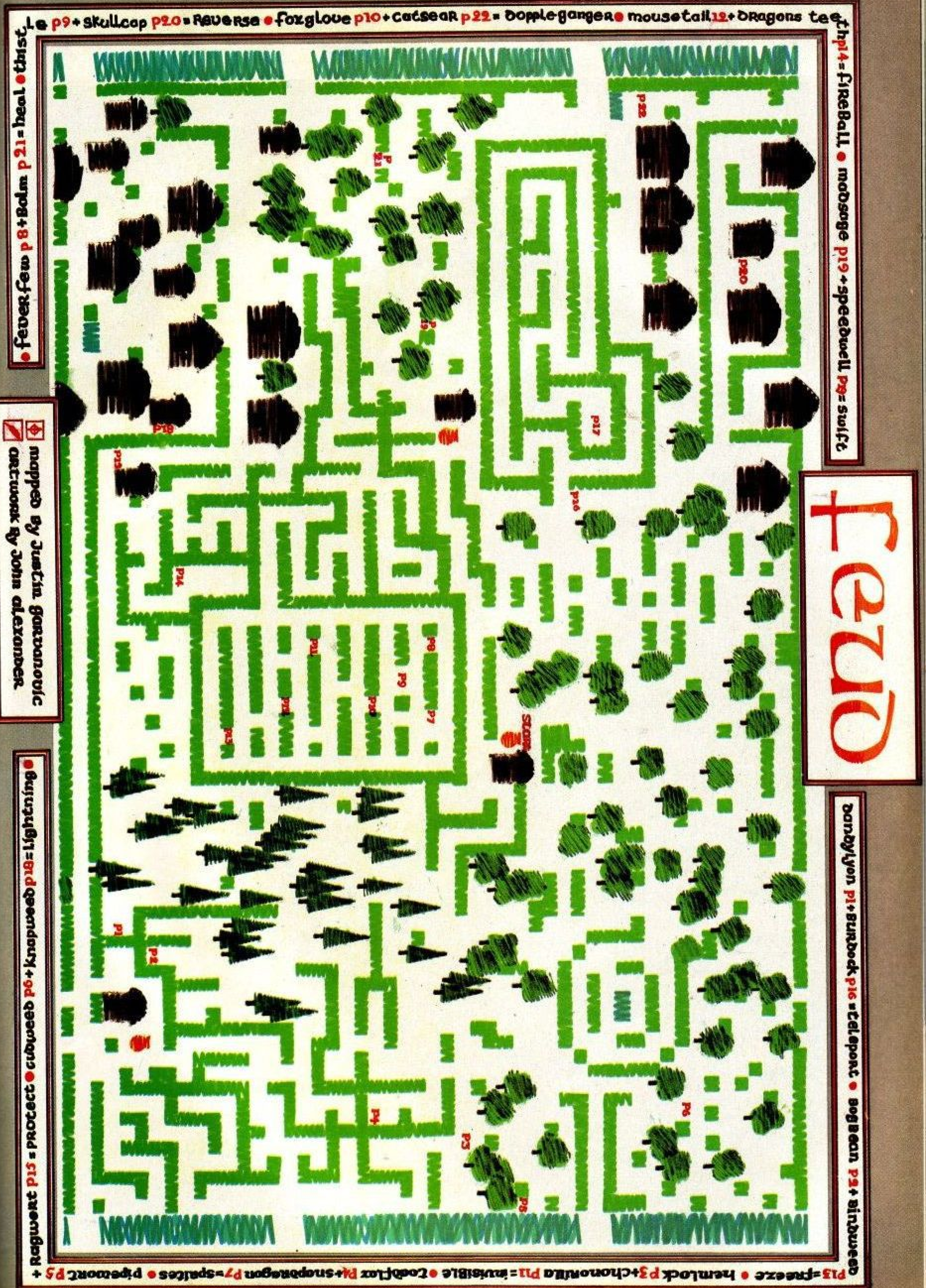
Now this poke is fun. Best one of the week, so I saved it for last. Instead of the sprites killing you it's now possible to use them for your own purposes. Stand on one to get at that high exit, for instance.

```
5 REM Head over Heels, immune poke
10 MODE 1:MEMORY 12345
20 LOAD ""
30 tot=0
40 FOR n=&BE00 TO &BE4E
50 READ a$:a=VAL("&"+a$)
60 POKE n,a:tot=tot+a
70 NEXT n
80 IF tot<>6550 THEN PRINT "Error
reading data":END
90 CALL &BE2C
100 DATA dd,21,40,00,11,2c,00,cd
110 DATA 4e,bc,21,13,be,22,6a,00
120 DATA c3,40,00,3e,18,32,bf,26
130 DATA 3e,c3,32,68,25,21,00,00
140 DATA 22,56,47,22,58,47,22,59
150 DATA 47,c3,00,01,21,40,be,3e
160 DATA c3,32,e2,39,22,e3,39,21
170 DATA ff,ab,11,40,00,c3,af,39
180 DATA 3e,c6,21,05,83,32,00,02
190 DATA 22,01,02,f3,f1,c9,4a
```

Lot of everything poke for the disc version of Head Over Heals. **IMPORTANT.** The lines 1-9 are only there to help in the use of this routine, They should **NOT** be typed in, repeat, should not be typed in. Very important that.

```
1 ' Head over Heals destroyer. (DISC)
2 ' Insert the disc and run me!
3 ' If you don't want any of the
4 ' functions listed below then just
5 ' leave out the lines following the
6 ' REM. ie if you dont want both
7 ' players to have super power then
8 ' leave out lines 240-250.
9 '
10 MODE 1:OPENOUT "d":MEMORY &4FF
15 PRINT"Dont worry !"
20 LOAD "ahead2",&C000
30 LOAD "ahead1.sbf",&500
40 tot=0
50 FOR n=&80 TO &9F
60 READ a$:a=VAL("&"+a$)
70 POKE n,a:tot=tot+a
80 NEXT n
90 IF tot<>2619 THEN PRINT"Check lines
130-160":END
100 READ a$:IF a$="end" THEN CALL &80
110 a=VAL("&"+a$):POKE n,a
120 n=n+1:GOTO 100
130 DATA f3,21,00,05,11,00,01,01
140 DATA 00,9f,7e,ee,76,12,23,13
150 DATA 0b,78,b1,20,f5,21,00,c0
160 DATA 11,00,a0,01,c0,0d,ed,b0
170 REM INFINITE LIVES
180 DATA 3e,18,32,bf,26,3e,c3,32
190 DATA 68,25 200 REM INVULNERABILITY
210 DATA 21,00,00,22,56,47,22,58
220 DATA 47,22,59,47
230 REM JUMP & SPEED FOR BOTH PLAYERS
240 DATA 3e,75,32,47,41,21,01,01
250 DATA 22,73,24
260 REM INFINITE DOUGHNUTS
270 DATA 3e,18,32,32,26
280 REM **** LEAVE THIS LINE INTACT ****
290 DATA c3,00,01,end
```

ACU


feud
feverfew p8 + Balm p21 = heal ● thistle p9 + skullcap p20 = Reverse ● foxglove p10 + catsear p22 = Dopple-ganger ● mousetail 12 + Dragons teeth p14 = Fireball ● madsage p19 + speedwell p9 = swift
dandylyon p1 + Burdock p16 = teleport ● Bogbean p2 + bindweed p13 = freeze ● hemlock p3 + chomomilla p11 = invisible ● toadflax p4 + snapdragon p7 = sprites ● pipewort p5 + Ragwort p15 = protect ● cudweed p6 + knapweed p18 = lightning ●
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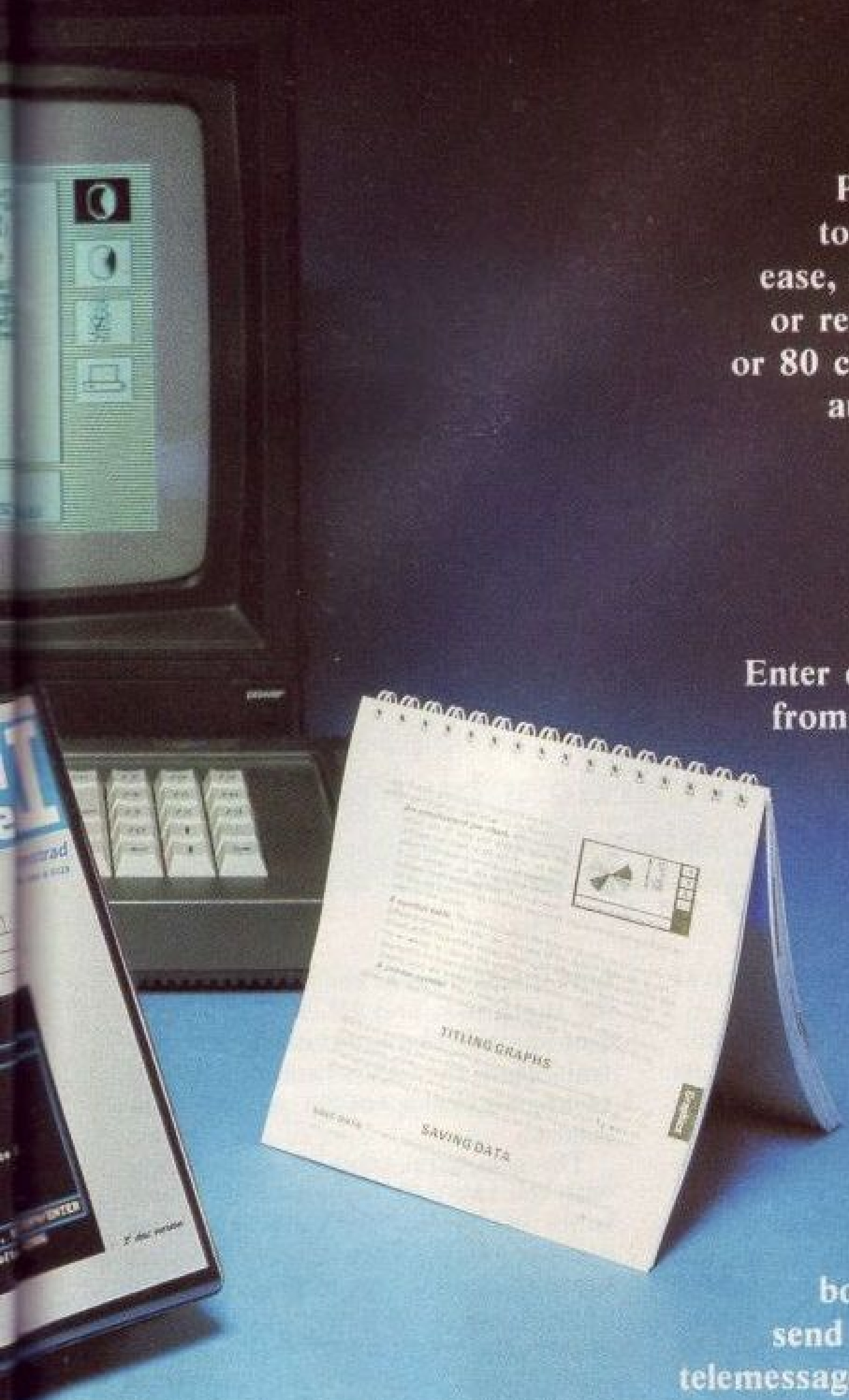
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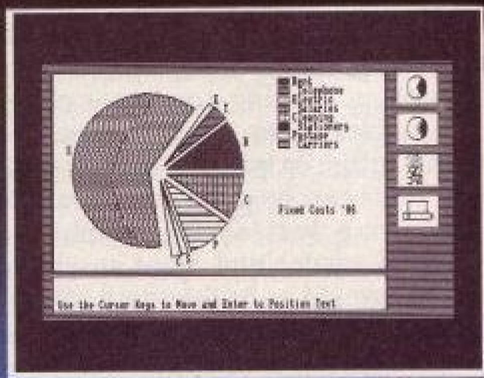
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ACU 6

Part 7 **ASSEMBLY POINT**

More colourful graphics for your 464

YOU want triangles? We got triangles. You want RSXs? We got RSXs. You want an article by Peter Green? Too bad, wise guy, here it is anyway . . .

ALTHOUGH the Amstrad CPC machines have a fairly good set of standard graphics routines, there's always room for improvement. Like the BBC Micro before it, the Amstrad permits both the Basic and machine code programmer access to its functions (eat your heart out, Commodore 64 users).

Unfortunately Basic 1.0 contains some minor glitches as a result of Locomotive Software's commendable insistence on meeting their launch deadline (eat your heart out, Sinclair users). One is that Basic programmers cannot change the graphics pen colour without plotting a point, or change the graphics paper colour without clearing the graphics window to that colour.

This can be annoying. You might be printing text at the graphics cursor (TAG mode) and want to change the foreground or background colour of the letters. You can manage the pen change by plotting a point off the screen (although that moves the graphics cursor too), but the firmware won't allow the graphics window to be moved off-screen, so you can't use that dodge for the paper.

Machine code programmers don't have the problem. Two firmware calls are provided, GRA_SET_PEN and GRA_SET_PAPER, which change the current graphics colours without any effect on screen contents.

Locomotive fixed this problem in Basic 1.1 on the CPC 664 and 6128, but 464 users needn't despair, because the Amstrad can add extra commands to its Basic. These are indicated to the Basic interpreter by prefixing them with a | character (so they're known as bar commands).

They may be contained in an external rom, for example |DISC, |TAPE and |CPM in the disc drive rom, or they may in ram. In either case they are called Resident System Extensions – RSX for short.

The first RSX this month is the command |GCOL,pen,paper which lets the Basic programmer set the graphics colours directly. It is very simple routine, in fact all it really does is provide a way of getting the colour parameters from Basic variables into the Z80's A register and calling the relevant firmware routine (the BBC Micro's ability to set up the CPU registers directly from Basic is sorely missed on the Amstrad).

Such a simple routine should make it easy to understand the way RSXs are written and installed, before we look at a more complicated example.

An RSX is just a machine code subroutine like any other. It can be called from another piece of machine code. For Basic to get at it, you must decide on a name for the subroutine (just as the existing Basic commands have names such as PRINT, GOTO and CLS).

Then you tell Basic the address of the machine code routine to run whenever it comes across this name (preceded by a |) in a Basic program. This is called "installing the RSX".

Using an assembler makes writing and installing an RSX very easy. Listing 1 starts with the installation of two RSXs. Firmware Guide owners can look up KL–LOG–EXT (address &BCD1) and see that it requires BC to hold the address of the command table for the RSXs, and HL the address of four spare bytes anywhere in the central 32K of the CPC's ram for the CPC to use as workspace for its own purposes.

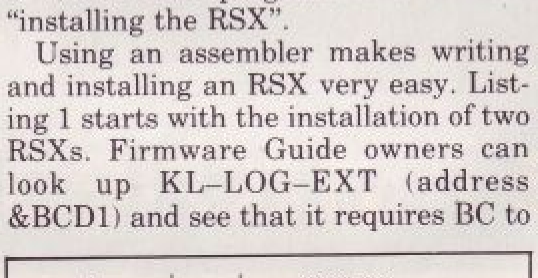


Figure I

The command table, in turn, starts with the two-byte address of the name table (a list of the new command names), followed by a series of jumps to the routines for the commands – the jumps to be in the same order as the names in the name table, of course. This forms a jumpblock for your added commands similar to the firmware's jumpblock for its own routines.

Note that the entries in the name table must be in capitals and the top bit of the last letter must be set. The name table is terminated with a zero byte. As you can see, using assembler labels makes the construction of these tables trivial – the assembler does all the hard work of calculating addresses.

Finally, note that the leading | s are left out of the table. These are not part of the name, but just an indication to the Basic interpreter that an RSX name follows.

Making a pass

So now Basic knows where to find the new commands. Suppose you need to pass parameters to the routine – in the case of |GCOL, the two required colours – how is that done?

The Amstrad has a simple, fixed con-



vention about this. At the Basic level, the parameters are listed after the command, separated by commas (including one between the command and the first parameter). Constants, variables, expressions or address references may be used, such as:

gpaper

At the machine code level, when the computer enters your subroutine the A register contains the number of parameters in the list and the IX register points to a list of the actual values passed. These are always converted by Basic into two byte values as follows:

Intelt

Real expression: Value of real result forced to unsigned integer.

Address reference address of the value of the variable (for strings, the value is the string descriptor, that is, three bytes containing its length and address).

Note that IX points to the last parameter in the list, that the list extends upward in memory, and the two-byte values are stored in normal Z80 format – least significant byte in the lowest byte, most significant byte in the higher byte. Figure I shows how the parameters would be passed for the command GCOL,2,3.

Basic has no way of knowing how many parameters the machine code is expecting, so the first thing you should always do is check that the number in A is the correct one, thus:

CP n; where n is the number of parameters you expect RET NZ; if you didn't get that number, quit and return to Basic immediately.

This is the simplest procedure, just aborting the command, but you can do something more sophisticated, as Arnor does on all its extension roms, which is to prompt the user for any missing parameters and wait for them to be typed in.

Remember that A and IX are the only registers whose contents have any meaning on entry to your machine code subroutine. Never assume anything about the contents of any other registers or the flags. Your routine can exit with any registers altered except SP, AF' and BC' (that is, the alternate AF and BC registers).

The GCOL routine is so simple as to be trivial. After the mandatory check for two parameters, the graphics pen colour is loaded into A from the parameter list indexed by IX and the appropriate firmware routine called. Since the pen colour came first in the Basic list, it is second in the machine code list (that is, stored at (IX+2), (IX+3)). We only need the lowest byte since legal pen colours are always less than 16, so the high byte is immaterial.

Then the paper colour at (IX+0) is copied to A and a jump made to GRA_SET_PAPER. Using a JP instead of a CALL means that the RETurn at the end of GRA_SET_PAPER will go back to the Basic interpreter.

The eternal triangle

One of the nicest features of the BBC Micro is its ability to draw solid triangles. These are much more useful graphics building blocks than rectangles because triangles can be used to draw any type of solid polygon.

You could also use thin triangles with a common corner (vertex to the mathematicians) to produce circles, pie charts and so on.

Our second RSX is a triangle drawing routine. The parameters passed to it are the three x, y coordinates of its vertices in user coordinates (same as the LINE, PLOT, MOVE and TEST commands from Basic) and the triangle is drawn using the current graphics pen colour and the current screen access mode (FORCE, AND, OR or XOR).

Only points of the triangle lying inside the current graphics window are plotted, thus it dovetails neatly into the existing graphics system.

Two entry points are provided. The label bar_triangle is the entry point from Basic when used as an RSX. Alternatively, machine code programmers can load the parameters directly into the routines variables b3-a1 (noting the reversed storage order as explained above) and CALL triangle, the second entry point.

This is the most complicated subroutine so far in this series, and it introduces a number of new and advanced ideas all at once, I'm afraid. Consequently the assembly listing has copious comments that try to explain the fine detail of the program, while the rest of this article covers the broader concepts.

It's a set-up

Once the parameters have been loaded into the variable area by bar_triangle or another machine code program, find_mode calculates the number of user coordinate points per pixel for the currently-selected screen mode. This is necessary because the graphics system has a fixed coordinate system, user coordinates, in which the screen is always 640 points wide by 400 points high.

However, the SCR_HORIZONTAL routine which the firmware uses to draw horizontal lines works in base coordinates, which are equivalent to pixels (the screen is 200 pixels high and 160, 320 or 640 pixels across).

The program converts each vertex from user to standard coordinates



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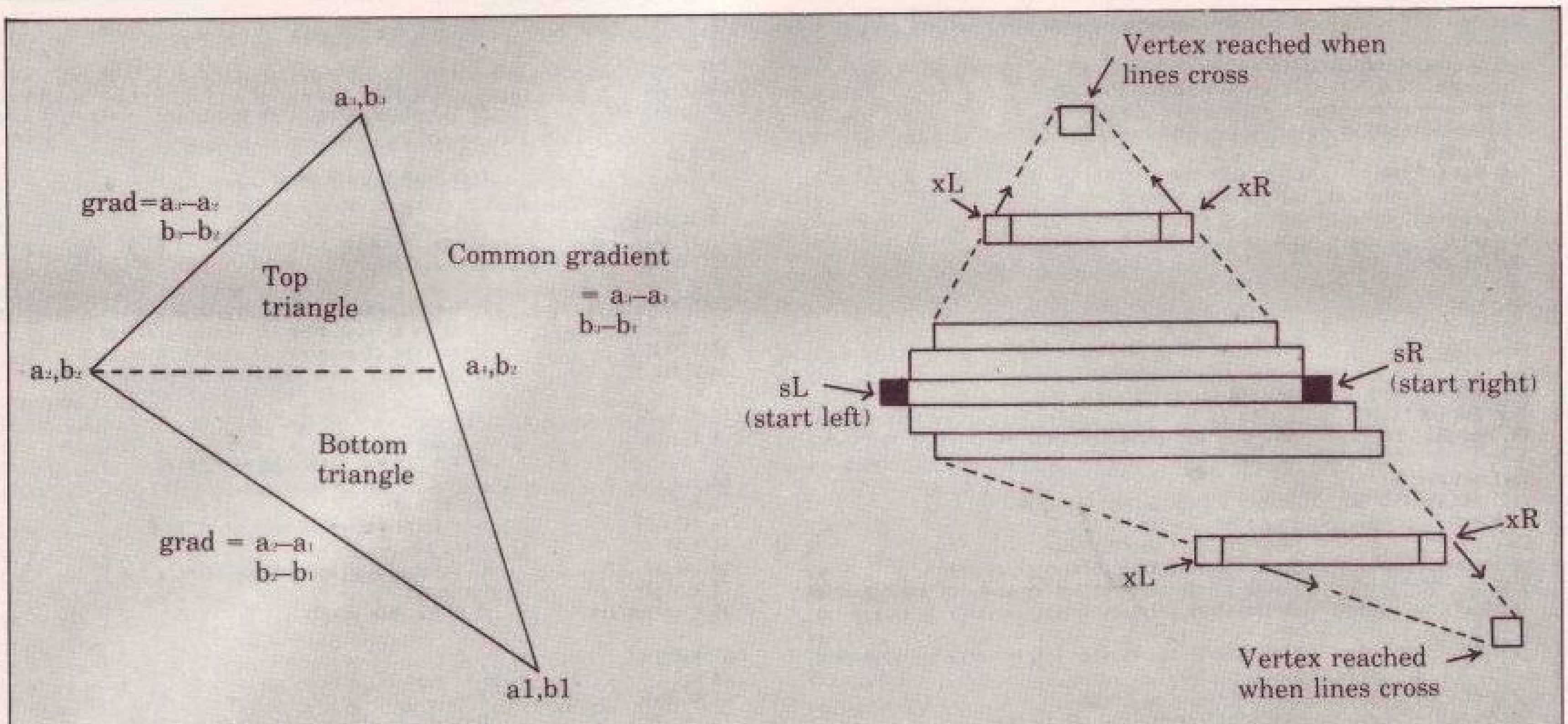
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ACUP6



Split triangle into two halves with horizontal line through (a_2,b_2). Use this as a baseline for two smaller triangle, one pointing up, the other down. Special cases:
If $b_2=b_3$ then $a_4=a_3$: no top triangle
If $b_2=b_1$ then $a_4=a_1$: no bottom triangle
If any two gradients are equal, then the three points are colinear and the triangle is just a line drawn from a_1,b_1 to a_3,b_3

Figure II

(using the offset of the graphics origin) and then to base coordinates using dx, the conversion factor.

Next the vertices are sorted into ascending order by y coord. If two vertices have the same y coord they are sorted by x coord. Then the edges of the current graphics window are obtained – using GRA_GET_W_WIDTH and GRA_GET_W_HEIGHT – and converted to base coordinates in the same way as the vertices.

The rest of the procedure uses the algorithm shown in pseudocode, which is like English but not a real programming language in Listing II, with the diagram in Figure II. You should be able to match up the pseudocode with the corresponding blocks of assembly language in Listing I. It uses 32 bit variables because we need 16 "binary places" to allow for the fractional gradients.

The algorithm works by drawing a horizontal baseline through the middle y coord (b2) to split the big triangle into a top and bottom half, which are then drawn separately using a series of horizontal line segments. The drawing loops terminate when the two lines cross over.

A special colinear routine is needed when the three points lie in a straight line, as parallel lines cross at infinity and the program would take rather a long time to run!

```
ORG &9000

write "rsxcode"

GRA_MOVE_ABSOLUTE        EQU &BBC0
GRA_GET_ORIGIN           EQU &BBCC
GRA_GET_W_WIDTH          EQU &BBD5
GRA_GET_W_HEIGHT         EQU &BBD8
GRA_SET_PEN              EQU &BBDE
GRA_GET_PEN              EQU &BBE1
GRA_SET_PAPER            EQU &BBE4
GRA_LINE_ABSOLUTE        EQU &BBF6

SCR_SET_MODE             EQU &BC0E
SCR_GET_MODE             EQU &BC11
SCR_INK_ENCODE           EQU &BC2C
SCR_HORIZONTAL           EQU &BC5F

KL_LOG_EXT               EQU &BCD1


.init_RSX
LD BC,command_table
LD HL,workspace
JP KL_LOG_EXT            ;Log the RSX's and return to BASIC

.command_table
WORD name_table          ;Address of table of names of commands
JP bar_triangle          ;Jumpblock entry for triangle
JP bar_gcol              ;and for graphics colour

.name_table
TEXT "TRIANGL",'E'+&80   ;Two names, each with top bit of last letter
TEXT "GCO",'L'+&80       ;set and all letters in capitals
TEXT 0                   ;Null byte to terminate table

.workspace
RMEM 4                   ;Bit of RAM for the CPC to store pointer bytes


.bar_gcol
;-----------------------------------------------
;Entry conditions; A=no. of parameters (from BASIC)
;                  IX points to parameters (2 words)
;Exit conditions;  AF corrupt
;-----------------------------------------------

CP 2                     ;right number of parameters?
RET NZ                   ;quit if not 2

LD A,(IX+2)              ;get ink no. for pen
CALL GRA_SET_PEN         ;set graphics pen colour
LD A,(IX+0)              ;get ink no. for paper
JP GRA_SET_PAPER         ;set graphics paper colour and quit


.bar_triangle
;-----------------------------------------------
;Entry conditions; A=no. of parameters (from BASIC)
;                  IX points to parameters (6 words)
;Exit conditions;  All registers corrupt
;-----------------------------------------------

CP 6                     ;right no. of parameters?
RET NZ                   ;quit if not 6

PUSH IX
POP HL                   ;Transfer pointer to parameters from IX to HL via stack
LD DE,b1                 ;Point to storage area for vertex coords
LD BC,12                 ;Six words = 6*2 = 12 bytes to move
LDIR                     ;This instruction copies BC bytes from HL to DE
```

Listing I

```
.triangle               ;secondary entry point from other machine code routines
;-----------------------------------------------
;Entry conditions; Parameters (6 words) in b3-a1
;Exit conditions;  All registers except IY corrupt
;-----------------------------------------------

.find_mode
CALL SCR_GET_MODE       ;What mode are we in?
LD A,4                  ;dx is 4 for Mode 0
JR C,set_dx
LD A,2                  ;dx is 2 for Mode 1
JR Z,set_dx
LD A,1                  ;dx is 1 for Mode 2

.set_dx
LD (dx),A               ;Store dx ( = 2^(2-mode))

CALL GRA_GET_PEN        ;Get the current graphic ink
CALL SCR_INK_ENCODE     ;Encode it to cover a screen byte in current mode
LD (ink),A              ;Store it for use later by screen drawing routines

.convert_coords
CALL GRA_GET_ORIGIN     ;Origin X to DE, origin Y to HL
LD B,H
LD C,L                  ;Copy origin Y coord to BC
LD (stack),SP           ;Save the address of the stack pointer
DI                      ;Disable interrupts before we move the stack pointer
LD SP,a3                ;Point stack pointer to last variable in vertex list

LD A,3                  ;Initialize loop counter (three vertices to process)

.cnvrt1
POP HL                  ;Get X parameter (in user coords)
ADD HL,DE               ;Add X coord of origin (now in standard coords)

PUSH AF                 ;Save counter (overwrites X parameter)
LD A,(dx)               ;Get no. of coords per pixel
JR cnvrt3               ;Jump into middle of the division loop

.cnvrt2
SRA H
RR L                    ;Divide HL by 2

.cnvrt3
RRCA                    ;Shift A right and loop back to divide HL by 2
JR NC,cnvrt2            ;until "1" bit drops into the carry flag
POP AF                  ;Restore counter
PUSH HL                 ;Store adjusted X parameter (now in base coords)

DEC SP
DEC SP                  ;Move SP to next variable (which is lower in memory)
POP HL                  ;Get Y parameter (in user coords)
ADD HL,BC               ;Add Y coord of origin (now in standard coords)
SRA H
RR L                    ;Divide HL by 2
PUSH HL                 ;Store adjusted Y parameter (now in base coords)
DEC SP
DEC SP

DEC A                   ;Decrement loop counter
JR NZ,cnvrt1            ;Loop for three pairs of X,Y parameters

LD SP,(stack)           ;Restore the stack pointer
EI                      ;Can now safely enable interrupts

CALL swap_23            ;Compare vertices 2 and 3 and swap if necessary
CALL swap_12            ;Compare vertices 1 and 2 and swap if necessary
CALL swap_23            ;Compare vertices 2 and 3 and swap if necessary

.convert_window
CALL GRA_GET_W_WIDTH    ;Get left/right edges in standard coords
LD A,(dx)               ;Get no. of coords per pixel
JR cnvrt5               ;Jump into middle of division loop

.cnvrt4
SRA H
RR L                    ;Divide HL by 2
SRA D
RR E                    ;Divide DE by 2

.cnvrt5
RRCA                    ;Shift A right and loop back to divide HL, DE by 2
JR NC,cnvrt4            ;until "1" bit drops into the carry flag

LD (win_L),DE           ;Store left and right edges of graphics window in
LD (win_R),HL           ;base coordinates

CALL GRA_GET_W_HEIGHT   ;Get top/bottom edges in standard coords
SRA H
RR L                    ;Divide HL by 2
SRA D
RR E                    ;Divide DE by 2

LD (win_T),DE           ;Store top and bottom edges of graphics window in
LD (win_B),HL           ;base coordinates

.common_grad            ;calculate the gradient of the common side
LD HL,(b3)
LD DE,(b1)
XOR A
SBC HL,DE               ;HL = (b3-b1)
JP Z,colinear           ;If (b3-b1)=0, then three points are in straight line

LD B,H
LD C,L                  ;Else move (b3-b1) to BC

LD HL,(a3)
LD DE,(a1)              ;NB. carry always clear here since b3>b1
SBC HL,DE               ;HL = (a3-a1)

CALL M,neg_HL           ;If result negative, then negate HL (make it positive)
LD IX,gradR             ;Point to storage area for common gradient
LD (IX+0),A             ;Store sign of gradient of line31 (0 or &FF)
CALL div_32             ;Calculate and store magnitude of gradient 3,1

LD HL,(b3)
LD BC,(b2)
XOR A                   ;Make A = 0 and clear the carry flag
LD D,A
LD E,A                  ;Let DE = 0
LD (sL),DE              ;Initialize bottom 16 bits of sL to 0
LD (sR),DE              ;Ditto sR
SBC HL,BC               ;HL = (b3-b2), flags set accordingly
LD HL,(a3)              ;Let HL=a3
JR Z,sort_start         ;If b3=b2 then sL=a3

LD H,B
LD L,C                  ;Else move b2 to HL
LD BC,(b1)
SBC HL,BC               ;HL=b2-b1 (carry must be clear as b3>b2)
LD B,H
LD C,L                  ;Move (b2-b1) to BC
LD HL,(a1)              ;Let HL=a1
JR Z,sort_start         ;If b2=b1 then sL=a1

LD (sR+2),HL            ;Else store a1 temporarily in top word of sR
LD HL,(gradR+3)
LD DE,(gradR+1)         ;Let HLDE = gradient of common line
LD IX,gradL             ;Use gradL as temporary 32-bit store
LD A,(gradR)            ;Get sign of common gradient
LD (IX+0),A             ;Copy sign of gradR to temp store
CALL mult_32            ;Let gradL=(b2-b1)*gradR

LD DE,sR                ;Point to sR
LD HL,gradL             ;Point to temp store
CALL step_up            ;Let sR = gradL + a1 (uses 32-bit addition routine)
LD DE,(sR)
LD HL,(sR+2)            ;Now let HLDE=calculated value of sR

.sort_start             ;Here, HLDE = sR (either a3, a1 or calculated value)
LD BC,(a2)              ;Let BC   = sL (always a2)
LD (sL+2),BC            ;Store top 16 bits of sL
LD (sR),DE              ;Store bottom 16 bits of sR
LD (sR+2),HL            ;Store top 16 bits of sR

LD HL,sL                ;Point to sL
LD DE,sR                ;Point to sR
CALL CP_32              ;Do sR-sL (32-bit signed comparison)

LD HL,gradL             ;Point to gradient for left-hand base vertex
LD DE,gradR             ;Point to gradient for right-hand base vertex
JR NC,ss2               ;NC means sR>=sL so right and left are correct
LD B,9                  ;Else need to swap over 9 bytes (5 grad, 4 coord)
PUSH DE                 ;Also need to swap address of the gradient that changes

.ss1
LD A,(DE)               ;Get byte from one variable
LD C,A                  ;Save in C
LD A,(HL)               ;Get byte from other variable
LD (HL),C               ;Replace each byte
LD (DE),A               ;in the opposite variable
INC HL
INC DE                  ;Increment both the pointers
DJNZ ss1                ;Loop 9 times

POP HL                  ;Get the address of the changing gradient into HL

.ss2
LD (add_grad),HL        ;Store the address of the changing gradient for use by
                        ;the triangle_2 routine

.triangle_1             ;Routine to draw the upper triangle (if it exists)
LD HL,(b3)
LD DE,(b2)
LD (ycoord),DE          ;Store b2 as y coord of triangle baseline
XOR A                   ;Let A = 0 and clear carry
SBC HL,DE               ;HL = b3-b2
JR Z,triangle_2         ;Don't draw upper triangle if b2=b3, do lower one

LD B,H
LD C,L                  ;Else copy b3-b2 to BC

LD HL,(a3)
LD DE,(a2)              ;NB. carry always clear here since b3>b2
```

```
SBC HL,DE              ;HL = (a3-a2)

CALL M,neg_HL          ;If result negative, then negate HL (make it positive)
LD IX,(add_grad)       ;Point IX to non-common gradient store
LD (IX+0),A            ;Store sign of non-common gradient
CALL div_32            ;Calculate and store magnitude of this gradient

LD HL,gradL            ;Now we have two gradients. Point to them using
LD DE,gradR            ;the HL and DE registers and use a 32-bit
CALL CP_32             ;comparison routine to check if they're equal
JP Z,colinear          ;If they are, then three points are in straight line

LD HL,sL               ;Else use the block copy instruction to initialize
LD DE,xL               ;the actual x coords of the triangle sides to the
LD BC,13               ;triangle baseline endpoints sL and sR
LDIR

.t1_loop
LD DE,(xL+2)           ;Get 'integer' part (top word) of left x coord
LD HL,(xR+2)           ;Get 'integer' part (top word) of right x coord
CALL CP_HLDE           ;Compare them
JR C,triangle_2        ;When right<left, lines have crossed over so finished

LD B,H
LD C,L                 ;Else copy rightmost coord to BC
CALL draw_line         ;and try to draw the horizontal line segment

LD DE,xL               ;Point to left x coord
LD HL,gradL            ;Point to left gradient
CALL step_up           ;Add or subtract step size to xL (32-bit addition)
LD DE,xR               ;Point to right x coord
LD HL,gradR            ;Point to right gradient
CALL step_up           ;Add or subtract step size to xR (32-bit addition)

LD HL,(ycoord)         ;Top triangle is drawn upwards, so get y coord
INC HL                 ;Increment it
LD (ycoord),HL         ;Put it back
JR t1_loop             ;and loop round to draw next highest line segment


.triangle_2            ;Routine to draw the lower triangle (if it exists)
SBC A,A                ;If carry set, A=&FF (upper drawn) , else A=0 (no upper)
LD HL,(b2)
LD (ycoord),HL         ;Reset y coord to triangle baseline
LD DE,(b1)
OR A                   ;Clear carry but preserve contents of A
SBC HL,DE              ;HL = b2-b1
RET Z                  ;Don't draw lower triangle if b1=b2, just quit

LD (stack+2),A         ;Else save A in a spare byte (0 means no top triangle)
LD B,H
LD C,L                 ;Move (b2-b1) to BC

XOR A                  ;Zero A and clear the carry
LD HL,(a2)
LD DE,(a1)
SBC HL,DE              ;Let HL = (a2-a1)

CALL M,neg_HL          ;If result negative, then negate HL (make it positive)
LD IX,(add_grad)       ;Get pointer to the changing gradient
LD (IX+0),A            ;Store sign of gradient for line12
CALL div_32            ;Calculate and store magnitude of this gradient

LD HL,sL               ;If we get here, the points can't be colinear, so don't
LD DE,xL               ;bother to check if gradients are equal. Just use the
LD BC,13               ;block move instruction tore-initialize
LDIR                   ;the x coords (line endpoints) to sL and sR

LD A,(stack+2)         ;Get flag whether to draw top line of bottom triangle
OR A                   ;Was it 0 or &FF?
JR NZ,t2_skip          ;If &FF, skip over top line of bottom triangle for
                       ;reasons given in Listing 2.

.t2_loop
LD DE,(xL+2)
LD HL,(xR+2)
CALL CP_HLDE
RET C                  ;Same as t1_loop except when lines cross, we've finished

LD B,H
LD C,L
CALL draw_line

.t2_skip
LD DE,xL
LD HL,gradL
CALL step_down         ;Add or subtract step size to xL
LD DE,xR
LD HL,gradR
CALL step_down         ;Add or subtract step size to xR

LD HL,(ycoord)         ;For bottom triangle we are working down the screen
DEC HL                 ;so decrement HL
LD (ycoord),HL
JR t2_loop             ;As t1_loop. Loop until finished.

.colinear              ;Routine to handle situation when the three points
                       ;lie on a straight line
CALL GRA_GET_ORIGIN
LD B,D
LD C,E                 ;Move standard X coord of origin to BC
LD (stack),HL          ;Save standard Y coord of origin in handy variable

LD HL,(a3)
LD DE,(a1)             ;Let HL and DE = greatest and least base x coords
LD A,(dx)              ;Let A = no. of coords/pixel
JR col2                ;Jump into loop

.col1
ADD HL,HL              ;Multiply HL by 2
EX DE,HL               ;Swap HL and DE
ADD HL,HL              ;Multiply DE by 2
EX DE,HL               ;Swap back again

.col2
RRA                    ;Shift A right and loop back to multiply HL, DE by 2
JR NC,col1             ;until '1' bit drops into the carry flag

OR A                   ;Clear carry. HL = rightmost x coord in standard coords
SBC HL,BC              ;HL = rightmost x coord in user coords
PUSH HL                ;Save HL
EX DE,HL               ;Get leftmost x coord in standard coords
OR A
SBC HL,BC              ;HL = leftmost x coord in user coords
EX DE,HL               ;Move it back to DE
LD HL,(b1)             ;Get y coord of leftmost point
ADD HL,HL              ;Double it to get standard coordinate
LD BC,(stack)          ;Get standard Y coord of origin
OR A                   ;Clear carry
SBC HL,BC              ;HL = leftmost y coord in user coords
CALL GRA_MOVE_ABSOLUTE ;Move graphics cursor to leftmost endpoint
LD HL,(b3)             ;Get y coord of rightmost endpoint
ADD HL,HL              ;Double it to get standard coordinate
LD BC,(stack)          ;Get standard Y coord of origin
OR A                   ;Clear carry
SBC HL,BC              ;HL = leftmost y coord in user coords
POP DE                 ;Get rightmost x coord in user coords
JP GRA_LINE_ABSOLUTE   ;Draw a single line and return to BASIC


.swap_23
LD HL,(b2)
LD DE,(b3)
LD BC,(a3)
CALL CP_HLDE           ;Do 16-bit signed compare of y coords (ie do HL-DE)
RET C                  ;Quit if order is correct (ie if b3>b2)
JR NZ,sw23a            ;Else if y coords are not equal, swap the vertices

PUSH HL                ;Else if y coords are equal, compare x's. Save HL
LD HL,(a2)             ;Let HL=a3 (BC already = a3)
CALL CP_HLBC           ;Do 16-bit signed compare of x coords (ie do HL-BC)
POP HL                 ;Restore HL
RET C                  ;Quit if order is correct (ie if a3>a2)

.sw23a
LD (b2),DE             ;Else need to swap vertices. Store b2 and b3 values in
LD (b3),HL             ;b3 and b2 variables respectively

LD HL,(a2)             ;Then get a2 (BC still = a3)
LD (a2),BC             ;Swap the x coords over too
LD (a3),HL
RET                    ;and quit

.swap_12               ;This subroutine has identical structure to swap_23
LD HL,(b1)             ;except that it compares and swaps
LD DE,(b2)             ;the first two vertices
LD BC,(a2)
CALL CP_HLDE
RET C
JR NZ,sw12a

PUSH HL
LD HL,(a1)
CALL CP_HLBC
POP HL
RET C

.sw12a
LD (b1),DE
LD (b2),HL

LD HL,(a1)
LD (a1),BC
LD (a2),HL
RET

.draw_line
;---------------------------------------------------------------
; Subroutine to clip a horizontal line segment (in base
; coords) inside the graphics window and draw the line
;
; Enter with BC = xR, DE = xL
;---------------------------------------------------------------
```

```
LD HL,(win_R)           ;Get right-hand edge of window
CALL CP_HLDE            ;16-bit compare win_R and xL
RET C                   ;Quit if xL > win_R ('cos whole line is outside window)
CALL CP_HLBC            ;Else 16-bit compare win_R and xR
JR NC,dr1               ;If xR<=win_R then OK

LD B,H                  ;Else xR > win_R, so let xR = win_R
LD C,L                  ;(ie, clip line to fit inside window)

.dr1
LD HL,(win_L)           ;Get left-hand edge of window
CALL CP_HLBC            ;16-bit-compare win_L and xR
CCF                     ;invert carry flag 'cos operand order inverted
RET C                   ;quit if xR < win_L ('cos line outside window)
CALL CP_HLDE            ;Else 16-bit-compare win_L and xL
JR C,dr2                ;If xL<=win_L then OK

LD D,H                  ;Else xL < win_L, so let xL = win_L
LD E,L                  ;(ie, clip line to fit inside window)

.dr2
LD HL,(ycoord)          ;Now we know x coords are inside window. Get y coord
LD (stack),DE           ;Save contents of DE temporarily in handy variable
LD DE,(win_B)           ;Get bottom edge of window (in base coords)
CALL CP_HLDE            ;16-bit-compare ycoord and win_B
RET C                   ;Quit if y < win_B (line is below window)
EX DE,HL                ;Else move ycoord to DE
LD HL,(win_T)           ;Let HL = top edge of window (in base coords)
CALL CP_HLDE            ;16-bit-compare win_T and ycoord
RET C                   ;quit if y > win_T (line is above window)
LD HL,(stack)           ;Else recover the saved x coord into HL
EX DE,HL                ;Move x coord to DE, y coord to HL

LD A,(ink)              ;Get encoded screen ink into A
JP SCR_HORIZONTAL       ;Draw the line and return to the calling program

.CP_HLDE
;---------------------------------------------------------------
; Subroutine to compare HL and DE as signed 16-bit numbers
;---------------------------------------------------------------

PUSH DE                 ;Save D
PUSH HL                 ;Save HL

LD A,D                  ;Let D=D+&80, ie DE=DE+&8000
ADD A,&80               ;(Converts signed number to unsigned positive
LD D,A                  ;number, else flags aren't set as expected
                        ;(eg, would get -2 > 2 because &FFFE > 2)

LD A,H
ADD A,&80
LD H,A                  ;Ditto H

SBC HL,DE               ;HL and DE now both +ve numbers, so normal SBC works
POP HL                  ;Restore HL
POP DE                  ;Restore D
RET                     ;Exit with carry and zero flags set correctly

.CP_HLBC
;---------------------------------------------------------------
; Subroutine to compare HL and BC as signed 16-bit numbers
; Identical in operation to above routine using BC instead of DE
;---------------------------------------------------------------

PUSH BC
PUSH HL

LD A,B
XOR &80
LD B,A

LD A,H
XOR &80
LD H,A

SBC HL,BC
POP HL
POP BC
RET

.CP_32
;---------------------------------------------------------------
; Subroutine to compare two signed 32-bit numbers
; Enter with DE pointing to first operand, HL to second
; Routine sets flags for (DE string) - (HL string)
;---------------------------------------------------------------

OR A                    ;Clear the carry
LD BC,&0404             ;Initialise byte counter/zero-match counter

.cp32_LSBs              ;Loop to compare the three least significant bits
DEC B                   ;If B is 1, this sets the zero flag
JR Z,cp32_MSB           ;so we're on the MSB, and need to add &80 (converting
                        ;signed no. to unsigned positive no. as above)

LD A,(DE)               ;Get next byte pointed to by DE
SBC A,(HL)              ;Subtract byte pointed to by HL, including any borrow
                        ;from previous operation
```

```
JR NZ,CP32_NZa
DEC C                   ;If bytes match, decrement the zero-match counter

.CP32_NZa
INC DE
INC HL                  ;Increment the pointers
JR CP32_LSBs            ;Loop to compare next pair of bytes

.CP32_MSB               ;Now on highest byte, so need to add &80 to operands
RL B                    ;Save carry in B (B is no longer used)

LD A,(HL)               ;Get the (HL) byte
ADD A,&80               ;Add the offset
LD H,A                  ;Save adjusted byte in H (we don't need HL anymore)
LD A,(DE)               ;Get the (DE) byte
ADD A,&80               ;Add the offset
RR B                    ;Restore the carry flag

SBC A,H                 ;Compare the MSBs

JR NZ,CP32_NZb
DEC C                   ;If bytes match, decrement the zero-match counter

.CP32_NZb
RET                     ;Carry flag now indicates correct greater/less than
                        ;status, and if all four bytes matched, then the DEC C
                        ;will set the Zero flag, as required

.neg_HL
;---------------------------------------------------------------
; Routine to negate HL, ie HL=0-HL. Also returns with A=&FF (ie SGN (HL))
;---------------------------------------------------------------

XOR A                   ;Let A=0, and clear the carry
DEC A                   ;Let A=&FF
PUSH DE                 ;Save DE
EX DE,HL                ;Put HL into DE
LD HL,0                 ;Let HL=0
SBC HL,DE               ;Let HL=0-HL
POP DE                  ;Restore DE
RET                     ;Quit

.mult_32
;---------------------------------------------------------------
; Routine to multiply 32-bit unsigned number in HLDE by 16-bit unsigned number
; in BC, and store the result to 32 bits in four bytes pointed to by IX+1/4.
;---------------------------------------------------------------

XOR A                   ;Let A=0 and clear the carry
LD (IX+1),A
LD (IX+2),A
LD (IX+3),A
LD (IX+4),A             ;Initialize the 4-byte product to zero

.mult1                  ;Main multiplication loop starts here
RR B                    ;Fetch next least significant bit from BC (multiplier)
RR C                    ;(this also shifts a zero from the carry into B bit 7)
JR NC,mult2             ;Do not add multiplicend to product if no bit

LD A,E                  ;Else add the contents of HLDE to the contents of
ADD A,(IX+1)            ;memory pointed to by IX+4,IX+3,IX+2,IX+1, working
LD (IX+1),A             ;from the least significant byte to the most, including
LD A,D                  ;any carry between bytes and storing the result in
ADC A,(IX+2)            ;memory (this is the product).
LD (IX+2),A
LD A,L
ADC A,(IX+3)
LD (IX+3),A
LD A,H
ADC A,(IX+4)
LD (IX+4),A             ;(Phew!)

.mult2
EX DE,HL
ADD HL,HL               ;Multiply HLDE by the number base (ie HLDE=HLDE*2)
EX DE,HL                ;by adding it to itself.
ADC HL,HL

LD A,B                  ;Check if BC is zero (multiplication is done when all
OR C                    ;one bits shifted out of multiplier). Also clears carry
JR NZ,mult1             ;for shifting into top bit of B. Loop until zero.
RET                     ;Then quit

.div_32
;---------------------------------------------------------------
; Routine to divide 16-bit unsigned number in HL by 16-bit unsigned number
; in BC, and store the result to 32 bits in four bytes pointed to by IX+1/4.
; (16-bit unsigned quotient plus 16-bit fraction (16 'binary places')
;---------------------------------------------------------------

DI                      ;Have to use SP for arithmetic, so disable interrupts

XOR A                   ;Let A=0
LD (IX+1),A
LD (IX+2),A             ;Store the dividend temporarily in memory where the
LD (IX+3),L             ;quotient is going to go. The bits to the right of the
LD (IX+4),H             ;'binary point' are set to zero.
LD H,A
```

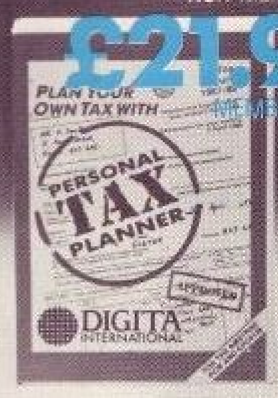
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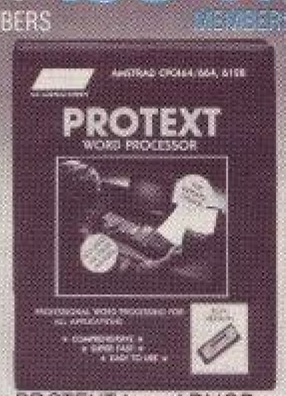
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```
LD L,A
LD D,A
LD E,A                   ;Zero HLDE, the 'running remainder'
LD (stack),SP            ;Save the stack pointer
LD SP,HL                 ;Set SP to zero
LD A,32                  ;Set loop counter for 32 bits

.div1                    ;Main division loop starts here
RL (IX+1)
RL (IX+2)                ;Shift carry into least significant bit of quotient,
RL (IX+3)                ;shift all bits up through memory, so that next most
RL (IX+4)                ;significant bit of dividend moves into carry flag
ADC HL,HL                ;Double DEHL and copy carry bit into least significant
EX DE,HL                 ;bit by using ADC
ADC HL,HL                ;(ie, DEHL = DEHL*2+carry)
EX DE,HL                 ;This forms the new 'running remainder'

SBC HL,BC                ;Now subtract the 32-bit divisor from the 32-bit
EX DE,HL                 ;'running remainder'. This is where we need an extra
SBC HL,SP                ;16-bit register, and can use the stack pointer
EX DE,HL

JR NC,div2               ;If no borrow, the divisor 'went', so DEHL contains the
                         ;the new 'running remainder'

ADD HL,BC                ;Else it didn't go, so add the divisor back again
EX DE,HL                 ;to restore the old 'running remainder'
ADC HL,SP
EX DE,HL
SCF                      ;Make sure the carry flag is set to 1

.div2
CCF                      ;If divisor went, want a 1 in the quotient, else want Ø
                         ;so complement carry flag (invert it)
DEC A                    ;Decrement the bit counter (doesn't affect carry flag)
JR NZ,div1               ;Loop until done all 32 bits

RL (IX+1)                ;However, here the least sig. bit of quotient is still
RL (IX+2)                ;in the carry flag, so do a final shift of the quotient
RL (IX+3)                ;to get the correct answer in (IX+4/1)
RL (IX+4)

LD SP,(stack)            ;Put back the stack pointer
EI                       ;Can now safely enable interrupts
RET                      ;and quit


;-----------------------------------------------
; Set of 32-bit addition and subtraction routines
;-----------------------------------------------


.step_up
XOR A                    ;Clear the carry and set A=Ø
LD B,4                   ;Initialize counter
OR (HL)                  ;Test the sign byte for pos/neg
INC HL                   ;Step pointer over the sign byte
JR Z,pos_grad            ;If positive, add the step value
JR neg_grad              ;else subtract it

.step_down
XOR A                    ;Clear the carry and set A=Ø
LD B,4                   ;Initialize counter
OR (HL)                  ;Test the sign byte for pos/neg
INC HL                   ;Step pointer over the sign byte
JR Z,neg_grad            ;If positive, subtract the step value, else add it

.pos_grad
LD A,(DE)                ;Get a byte from one 32-bit quantity
ADC A,(HL)               ;Add-with-carry the corresponding byte from the other
LD (DE),A                ;Store the result
INC HL
INC DE                   ;Move both pointers to the next pair of bytes
DJNZ pos_grad            ;Do all 4 bytes
RET                      ;then quit

.neg_grad
LD A,(DE)                ;Get a byte from one 32-bit quantity
SBC A,(HL)               ;Subtract-with-carry the byte from the other
LD (DE),A                ;Store the result
INC HL
INC DE                   ;Move both pointers to the next pair of bytes
DJNZ neg_grad            ;Do all 4 bytes
RET                      ;then quit


.dx                      WORD Ø  ;Store no. of user coords per pixel
.ink                     BYTE Ø  ;encoded ink for current graphics pen

.win_L                   WORD Ø  ;Left, right, top and bottom edges of
.win_R                   WORD Ø  ;current graphics window stored in base
.win_T                   WORD Ø  ;coordinates
.win_B                   WORD Ø

.gradL                   RMEM 5  ;Gradient of line through leftmost basepoint
.sL                      RMEM 4  ;x coord of leftmost basepoint
.gradR                   RMEM 5  ;Gradient of line through rightmost basepoint
.sR                      RMEM 4  ;x coord of rightmost basepoint

.add_grad                WORD Ø  ;Address to store gradient which changes
.ycoord                  WORD Ø  ;Base coord of current horizontal line segment

.xL                      RMEM 4  ;x coord of leftmost plotting point
.stack                   WORD Ø
                         RMEM 3  ;dummy bytes to match xL-xR with sL-sR
.xR                      RMEM 4  ;x coord of rightmost plotting point

.b1                      WORD Ø  ;Three pairs of 16-bit coordinates for the
.a1                      WORD Ø  ;three vertices. (Stored Y first, X second
.b2                      WORD Ø  ;by BASIC (see text).
.a2                      WORD Ø
.b3                      WORD Ø
.a3                      WORD Ø


**** END ****
```

```
If b3 = b1 THEN GOTO colinear ['cos points are in horizontal
line] LET gradR = gradient of line connecting points 1 and 3
[common gradient]              [grad = (a3-a1)/(b3-b1)]
IF b2 = b3 THEN LET a4 = a3
    ELSE IF b2 = b1 THEN LET a4 = a1
        ELSE a4 = (b2-b1)*gradR + a1    [by similar triangles - O
Level maths!]

LET sL = a2 : LET sR = a4 : LET address = address of gradL IF sL
> sR THEN SWAP sR,sL : SWAP gradR,gradL : LET address =  address
of gradR LET add_grad = address

LET ycoord = b2
IF b2 = b3 THEN LET flag = Ø : GOTO triangle_2 [no top triangle
to draw]    calculate second gradient [ = (a3-a2)/b3-b2)]
    STORE gradient at address contained in add_grad
    IF gradL = gradR THEN GOTO colinear [points are in a line]
LET xL = sL : LET xR = sR [set x coords of line segment to
baseline]

    .t1_loop
    IF xL>xR THEN flag=1:GOTO triangle_2 [at vertex when lines
cross]    CALL draw_line [draw a horizontal line from xL to xR at
height y]    LET xL = xL + gradL : LET xR = xR + gradR
    LET ycoord = ycoord + 1
    JR t1_loop
LET ycoord = b2
IF b1 = b2 THEN RETURN [no bottom triangle to draw]
    calculate second gradient [ = (a2-a1)/b2-b1)]
    STORE gradient at address contained in add_grad
    LET xL = sL : LET xR = sR [set x coords of line segment to
baseline]

    IF flag = 1 THEN GOTO t2_skip [otherwise in XOR mode the
baseline                                    would be plotted twice
and disappear]

    .t2_loop
    IF xL>xR THEN RETURN [at vertex when lines cross]
    CALL draw_line [draw a horizontal line from xL to xR at height
y]    LET xL = xL - gradL : LET xR = xR - gradR
    LET ycoord = ycoord - 1
    JR t2_loop

MOVE to a1,b1
DRAW to a3,b3
RETURN

IF xL > win_R THEN RETURN     [whole line is to right of window]
IF xR > win_R THEN xR = win_R [clip line to window edge]

IF xR < win_L THEN RETURN     [whole line is to left of window]
IF xL < win_L THEN xL = win_L [clip line to window edge]

IF ycoord < win_B THEN RETURN [line is below window]
If ycoord > win_T THEN RETURN [line is above window]

DRAW xL,ycoord TO xR,ycoord
RETURN
```

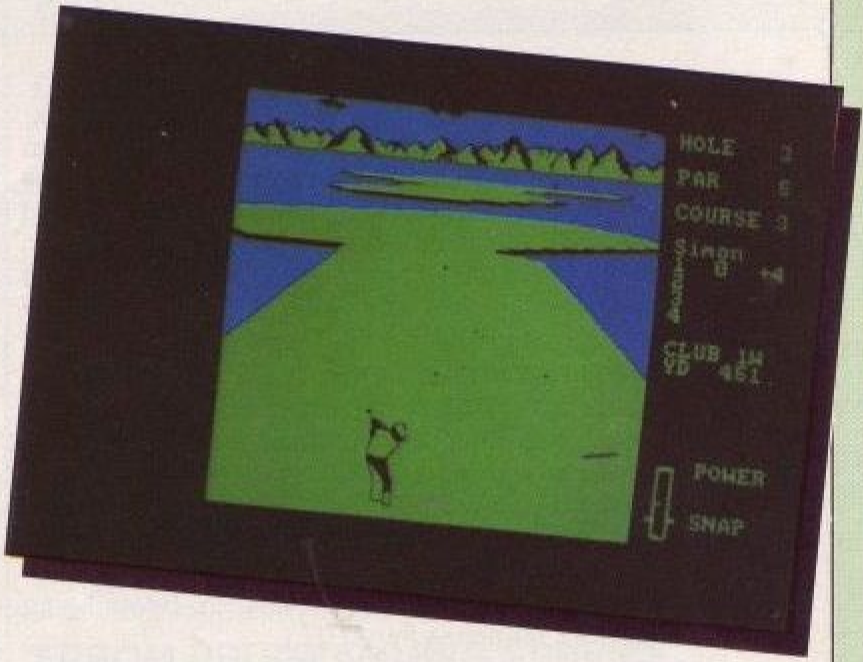
Listing II: Pseudocode algorithm for the triangle fill.

```
100 REM **MEMORY &8FFF:LOAD "rsxcode.bin
    ",&9000:CALL &9000
110 REM ** Load binary code and install
    RSXs. Unlike commercial RSXs, code i
    s not relocatable (couldn't cover re
    locatable code too!). So it's at a l
    ow but safe address.
120 MODE 1:BORDER 1:INK 0,1:INK 1,0:INK
    2,13:INK 3,24
130 DEFINT a,b,c,i
140 |GCOL,2,0:|TRIANGLE,300,600,150,20,3
    80,20
150 |GCOL,1,0:FOR i=180 TO 360 STEP 40:M
    OVE 280,600:DRAW i,20:NEXT
160 |TRIANGLE,145,55,335,40,140,20:|TRIA
    NGLE,345,-2,336,40,140,20
170 |TRIANGLE,400,60,335,40,410,25:|TRIA
    NGLE,345,-2,336,40,410,25:|TRIANGLE,
    400,60,376,70,378,50
180 |GCOL,2,0:|TRIANGLE,300,600,200,206,
    344,206
190 |GCOL,0,0:|TRIANGLE,0,280,600,280,30
    0,600
200 TAG!0:|GCOL,0,3:MOVE 206,260:PRINT "
             ";:MOVE 204,252:PRINT "
    ";
210 MOVE 196,218:PRINT "            ";:MOV
    E 198,226:PRINT "     ";
220 |GCOL,2,1:MOVE 274,242:PRINT " ";:M
    OVE 274,232:PRINT " ";
230 MOVE 330,242:PRINT " ";:MOVE 330,23
    2:PRINT " ";
240 MOVE 216,326:PRINT"          ";:MOVE 2
    16,318:PRINT"        ";:MOVE 216,310
    :PRINT"        ";:MOVE 216,302:PRINT
    "         ";:MOVE 216,294:PRINT"
    ";
250 MOVE 212,314:DRAWR 134,0:MOVE 212,29
    4:DRAWR 134,0:MOVE 240,280:DRAWR 0,5
    0:MOVE 280,280:DRAWR 0,50:MOVE 320,2
    80:DRAWR 0,50
260 ORIGIN 280,328:READ a,b,c,d:|TRIANGL
    E,0,0,a,b,c,d:|TRIANGLE,0,0,-a,b,-c,
    d
270 READ a,b:|TRIANGLE,0,0,a,b,c,d:|TRIA
    NGLE,0,0,-a,b,-c,d
280 READ c,d:|TRIANGLE,0,0,a,b,c,d:|TRIA
    NGLE,0,0,-a,b,-c,d
290 DATA 68,0,60,20,40,30,0,38
300 ORIGIN 0,0:MOVE 290,230:DRAWR 180,-5
    0:MOVE 290,228:DRAWR 180,-50
310 MOVE 346,230:DRAWR 50,10:MOVE 346,22
    8:DRAWR 50,10:MOVE 346,226:DRAWR 50,
    10
320 MOVE 342,340:DRAWR 50,-4:MOVE 342,33
    8:DRAWR 50,-4:MOVE 342,336:DRAWR 50,
    -4
330 |GCOL,1,0:MOVE 464,186:PRINT CHR$(23
    1);:MOVE 390,340:PRINT CHR$(231);:MO
    VE 260,360:|GCOL,3,2:PRINT CHR$(231)
    ;
```



A demonstration of the triangle routines

LEADER BOARD



There are two types of people, those who consider the game of golf to be enjoyable, and those who consider the game of golf to be the thinking man's valium. The former should read on. The latter should turn over.

Leaderboard is, as near as I can make out, a close simulation of the sporting bits of the game. No 19th hole, no cheating, no carefully-disguised power games. Just woods, irons and lots of balls.

Its proudest claim is that of true perspective. This allows the golfer to judge the course ahead, and get his shots down to a tee, be he novice, amateur or professional. These are the three classes of golfer – the easier the class, the less things like wind and lack of skill affect the shots.

You can also choose from a variety of courses and how many holes you want to play. Eighteen is the minimum; the maximum is a staggering 72. For that long weekend.

Once you've decided all the exciting details which go to make the game such a gas, like which club best suits the lie of the land, you can get down to some serious swinging. Using the joystick, and your skill and judgement, you can set parameters like power and wrist snap.

You might think that having your wrists snapped might be more enjoyable than having to play golf (I did warn you at the beginning to get out), but this is a technical term describing the exact way in which the power of the swing is imparted to the sphere at your feet. Depending on how you snap your wrists, the ball can be sliced or hooked, and will soar away into the distance accordingly.

After a shot or two the ball should have puttered its way to the green. From there, a different technique is needed to ease the thing down that tiny hole to the subtle plop-plop-plop sound so beloved of the aficionados of the game. Putting is much simpler than the power shots; just aim, set the power and shoot.

On screen, your tiny homunculus will carefully follow your instructions, and you can watch the beautifully animated shot miss the hole by miles, just like the real thing.

You can play against up to three other like-minded, consenting adults or children, or just by yourself. You can't play against the computer (it probably doesn't like golf), so a solitary game is just against the par numbers for the course.

As was stated in the beginning, there are two types of people. The first will enjoy this game, and consider it excellent value for money. The second are in no danger whatsoever of buying it, and thus won't be disappointed. Golf's like that...

Author: US Gold
Price: £9.95

Nigel

Ummmm... golf. Golf golf golf golf golf. Golf? Golf. Love it or hate it, it does exist. Unfortunate, but there you are. If it didn't, Golf would be a good name for a Tolkien monster, which would be worse. Possibly.

As a dispassionate reviewer, I have to say that the game is accurate, not too difficult to play and builds up in skill nicely. As a human being, I have to say that I find golf insanely dull, and this software is accurate in reflecting this. I admire the programming, though, the landscaping is decorative and useful.

10/20

Liz

Golf is one of those sports where the ethos extends beyond the green, usually into mail order catalogues, so it would be impossible to capture all the feel on a computer. Still I really, really enjoyed Leader Board.

The courses seem to have a fair bit of water separating them, so much so that a dinghy would seem to be a better bet than a golf cart. Perhaps this is a good way to learn the principals of golf before trying the real thing.

17/20

Colin

First of all, let me confess that I don't play any sports. Still, I quite enjoy watching them on TV. If it wasn't for all that frantic exertion, I'd probably enjoy playing something.

So a computer version of a sport seemed to be right up my street....but of all the possible sports, did it *have* to be golf?

I can't even watch golf on the telly, because it bores me to tears. Still, having said all that, I quite accept that there are lots and lots of people who enjoy watching and playing golf (there must be, mustn't there?) and if you are of their number then you will enjoy this game. It is as near to the real thing as you can get without leaving your armchair.

14/20

DR LIVINGSTONE



In the dim and not so distant colonial past of our nation it was quite the done thing to go traipsing off into the deeper parts of the unexplored continents of the world to bring the benefits of enlightened Western civilization to the poor, benighted savage. Christianity and influenza were just two of the potent gifts that the lucky heathen got gratis. Doctor David Livingstone was solely concerned with the former.

Such explorers often got fame, respect and influence. They also got lost. This fate befell the good Doctor, and as he had already achieved the first three exploratorial attributes he was sorely missed. So missed that the New York Times sent Henry Morgan Stanley (noted for having two first names, one at each end) into the dark African jungle to find the mislaid medico. Beats being sent to product launches for *ACU*.

History relates how Stan the Man discovered tribes and learned their subtle social orders, becoming acquainted with the ways of the jungle. The game is a little different.

Armed with the four most indispensible tools a Victorian explorer and rescuer could hope for, grenades (eh?), a vaulting pole (eh??), a boomerang (eh???) and a knife (ah!), HMS strides into the jungle.

This last implement has gone down in folklore, from the famous incident when he escaped certain death by showing Chief Um BogoBogo how to cut his linoleum, the now traditional use for Stanley's Knife. But this lies some months ahead of him.

He starts in a clearing. The poisonous snake and man-eating plant do not exactly spell welcome, but nobody said it would be a picnic *(a picnic, and I brought the ants – ed)*. An experimental leap on to the ledge missed, and the plant demonstrates how it got its name. Scratch one hero.

Next time he gets on to the ledge, knocks out the snake with his boomerang, and gets on to the next screen. Before him lies a vast expanse of water, which proves, as is so often the case, to be unbreathable. As Jacques Cousteau has yet to invent the valve which makes the scuba practicable (or, indeed, has yet to be born), there goes another hero. Glub glub glub.

Our reincarnated Henry is a little more careful. He stays on dry land, but fails to notice the rabid chimp in the tree above him, who drops his nuts on the explorer's bonce... exit explorer.

This time, HMS leaps on a floating log before the savage simian can cause any more cranial contusion. Shame about the piranha which has swum the Atlantic just to sink its fangs into Henry's soft and tender parts.

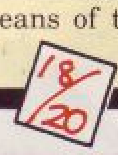
Get the gory picture yet? Henry has yet to get to the Sacred Temple of the Ujiji, or encounter the Stanleyphobic/phagic Africans which are dotted about the place. There's nothing he can't dispose of, given practice and one of his four implements of jungle survival. And time. Jet Set Willy meets Tarzan, Donkey Kong, Frogger and Indiana Jones. Hold on to your solar topee, this is gonna be quite a journey.

Author: Alligata
Price: £8.99

Nigel

There are seven basic themes, said someone literary, from which all novels ultimately derive. I have a sneaking suspicion that there are somewhat fewer behind the much abused arcade game genre.

This program certainly doesn't claim to be original. But when it's as playable as this, it doesn't matter a whit. The puzzles are kept coming as fast as you like, and the graphics are pretty enough for me. Complex, icon-driven, megagame it ain't, but worth the money it is. There are lessons here for the Oceans of this world.



Liz

Mode 0, sprites which Alligata have imported all the way from Spain. The magazines from the isthmus clearly loved these African antics and have regaled many pages with maps of the jungle jaunt. I don't think the game quite merits the European eulogy. It's a fair effort, better than some of the earlier productions from that quarter, but the price strikes me as being a bit steep.



Colin

I suppose the travels of great Victorian explorers are as good an excuse for a platform game as any. And this is as good an excuse for a platform game as many I've seen in my long and pitiful reviewer's life. Heaven help me, I even found myself enjoying it.

Lots of variety, lots of puzzles, none too tricky, lots of areas to explore, and the little man goes where you push the joystick. It doesn't take much to make a man happy . . .



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MicroLink application form: Page 24

GRAND PRIX SIMULATOR



Right, this is nice and simple. When you were young, or younger, you had, or have, a Scalextric track. This clips together in various strange permutations to make up a racing circuit.

On this circuit you powered an electric model, taking care not to go too fast on the corners in case you came off, and not too slow on the straight, in case you get overtaken by your best friend who always got the Formula One model because you were playing it at his house. And the hand controllers overheated.

Half the time, of course, you had to trim those metal braids which were supposed to make contact with the tracks but rarely did. No such problems with the latest game from Codemasters.

You and an optional friend have to steer cars around one of a selection of racing tracks. You have to go faster than he does but not come off the tarmac. And that's it.

There must be more to it than that, you cry. You should worry. You don't have to write a page full of description about the thing. Well, there are a few frills to go with the spills and thrills. As well as beating your buddy's lap time, you can go for the course record and thus the giddy heights of the High Score Table.

If you don't have a friend, and some people don't, the computer thoughtfully provides you with a drone car to race against.

From time to time tools appear on the track. Driving over these also increases your score in the usual manner. Beware, as you speed about the course of any oil slicks that might ooze out of the ground in front of you. Again, their effect on your trajectory is predictable but none the less tragic for all that.

The skill lies in the cornering. Your vehicle slides around the place in a worrying manner, and a deep appreciation of the Newtonian mechanics of the affair is vital. Unless you want to make close friends with the verge, of course.

Other salient features are the inevitable Jon-Paul "George-Ringo" Eldrige music on the intergame screen, and some gutteral voices informing you of the staggeringly obvious. I had hoped that the promised "Digital Voice Synthesis" might have a little of the "And NIgel MANsell has SPUN off the TRACK aGAIN" commentary in true Murray Walker style. But no. Perhaps the next generation of games machines . . .

In truth, the adage "Just taking the car for a quick spin" takes on more than a little verity with this one. You can choose which keys to use, but the sensitivity of the car and the friction coefficient of the track/tyre interface take a lot of getting used to.

Another tricky bit for the first time track traverser lies under the bridge. If you are sliding about from verge to verge, and you get stuck under the bridge, then there's nothing to do except wait for the timeout (or press the Escape key – wimp!).

If you think you're a bit nifty behind the wheel, shoehorn yourself in behind the joystick. It might be a surprise.

Author: Code Masters
Price: £1.99

Nigel

Another Codemasters production! And . . . yes, here it is . . . "Absolutely Brilliant" it says on the insert. Some things never change. The vocabulary, for example.

Cheap jibes aside, (the "superbly drawn graphics" are small orange/grey/red rectangles with a white splodge) this is a pretty good game. I generally think that Grand Prix should be pronounced as spelled, but this is rather fun. It's very difficult to get going, but once you do, just try stopping!

8/20

Liz

Activision has its work cut out to produce a better "Super Sprint" clone than this one. True, a few frills can be added like the odd helicopter, but Grand Prix simulator is excellent.

When the review copy came in I called my friends to tell them how wonderful it is. The drone car has a tendency to get lost and the game is very difficult, but still challenging. The speech was recognisable and added to the game. A brilliant game. And it's budget.

20/20

Colin

Your car is revving up, a cool detached voice is announcing the starters orders, and you're away. Actually getting the car to do what I wanted it to was a major feat in itself, but then I always tend to panic at high speeds.

I spent a couple of hours watching the arcade game being played a few weeks ago, and this compares very favourably. I particularly liked the two-person option, and the facility to set your own key controls. These minor details attended to, you whizz about, collecting spanners whenever they appear and completing your required number of circuits to move on to higher things.

A must for all budding speed fiends.

8/20

AUF WIEDERSEHEN MONTY



Our friend Monty the Mole has been through as many trials and tribulations as the micro industry itself. And the poor rodent has finally had enough. He's heard tell of another place, a land far, far away where moles can frolic in the trees unmolested (er...) and he's determined to get there. This place, Montos in the Aegean sea, is unfortunately a long, long away from the mole's current bolthole in Gibraltar.

His persecution has made Monty a bitter man. Ok, mole. All he wants to do now is make good his escape to the sunny island, and he doesn't care if he breaks the law a little to achieve this end. If Intermole want him for stealing coal, then they might as well want him for nicking the Mona Lisa.

According to the rubric, Monty wants to steal enough to buy the island, on which he will be safe as nobody knows of its existence. It's a good thing logic counts for naught in games such as these, really.

Still, Monty is now in Gib. He wants to be in Montos. Let's go, kiddies. In best Monty custom there are sundry assorted subgames to complete, all linked to some extent.

Monty has to make his way through a large selection of European countries in search of sufficient loot to grab his dream domain. Each of these countries has a little stereotyped contribution to make to the game.

The Germans, bless their little leather Lederhosen (sorry about the teutonic tautology) are partial to a drop of white wine. They'll be more than happy to grease Monty's paw if he pauses from Greece in order to drop in a drop of the old antifreeze. To be truthful, it's probably not antifreeze, because anything called Chateau Blanc just has to be pure of heart and of Victorian vintage.

More undemanding racial roles await in other principalities. Tennis in Sweden, tulips in Holland, bacon in Denmark. All play their part in this trans-Europe extravaganza.

Travel across borders is usually by flying. A recurring theme is the ticket hunt in the airport, followed by a little airborne jaunt. If you have any remaining ties to logic, abandon them at this point, as you have to (and I quote) "try to nibble the back of the other planes to increase your score" while in flight.

Italy is a little busier than usual. As well as being home to those helpful fellows called the Cosa Nostra (I don't think this game runs on the ST) there is that omen of ill-tiding, a female. Or a femole, if you want to be biologically accurate.

In general, men, girls tend to be best avoided. Otherwise things get a bit fraught... and I don't think moles are exempt from the great traumas of life. She's called Juliette, and that doesn't help our romantically-inclined rodent one shred.

Is this Monty's last stand? After he makes it to his island, will there be no more sequels? Who knows. But in the meantime, Monty zoomers can get their revenge on the rest of Europe. Should keep you going for a bit.

Author: Gremlin Graphics
Price: £8.95

Nigel

Another moldy molevelant moladoit bore from our burrowing bungler of the Talpa ilk? Well, no. I didn't make much headway in this game, but what I did was fairly pleasurable.

Like many other venerable videogame themes that have progressed through several incarnations, the playability has improved along with the programmers' experience. It's another epic, I'm afraid, but easy to get into and easy on the eye.

Try it at your local emporium. If after five minutes you want to play more then you'll probably find it worth the money.

16/20

Liz

Monty is a much-hyped mole. Along with the free badge is an offer to sent for a map of Europe. The old ladders and platforms theme is wearing well. As with all games of the genre, the skill comes in learning to control your character.

While I love this type of program, Auf Wiedersehen Monty failed to gel for me. The smooth sprites and clever puzzles failed to endear me. Perhaps I'm not a moley person. Perhaps Monty is becoming old hat, living on burrowed time.

17/20

Colin

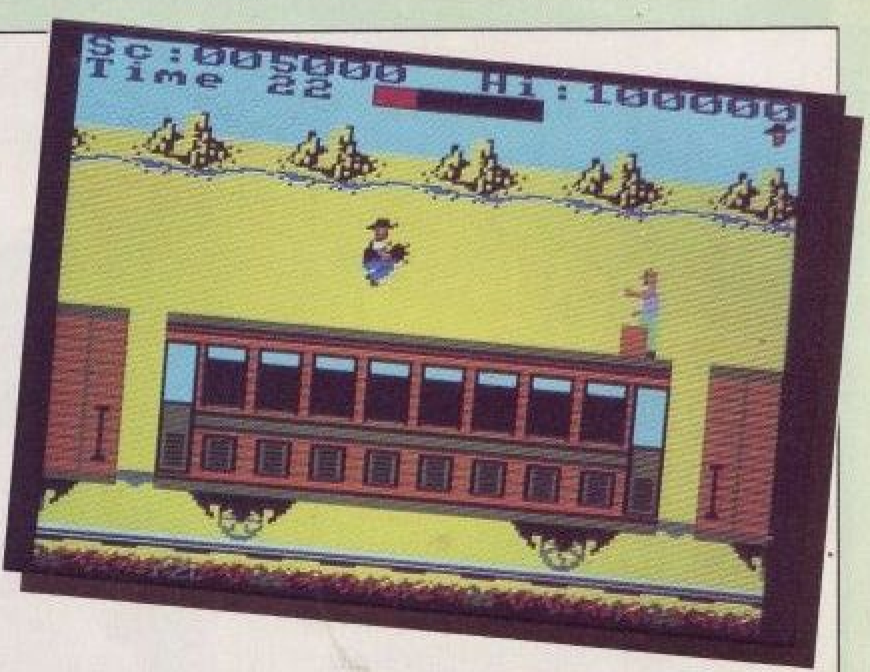
Good old Monty, intrepidly making his way across Europe (I should be so lucky) trying to get to the haven of his sunny Greek island (who isn't?).

I liked the little Monty character, cheekily bouncing around, collecting all the collectibles, and doing his best to avoid colliding with any nasties (of whom there are many).

The game is varied, as are the tasks Monty has to perform - no one said this was going to be easy. But the satisfaction, and relief, of guiding Monty through perils such as Mafia shoes to the safety of Montos leaves one with a warm glow of pleasure.

14/20

EXPRESS RAIDER



From out of the mysterious East (Poland, methinks) comes this game of the less-than-mysterious Wild West. But "Get the Gold! Shoot the Banker!" seems a curious mix of Keynsian monetarism and practical Marxist-Leninist theories of proletarian power acquisition. Or perhaps Cockney rhyming slang is more prevalent in Eastern Europe than our media would have us believe. Still, on with the show.

Since Grasshopper first blew flute in the sandy deserts of the rough and tumble western United States, we've been aware of the prevalence of the martial arts in the land of the Colt 45. It is true that there might be those more skilled in such matters than our hero, who appears to be limited to kicking, punching and jumping, but that doesn't deter him in the slightest.

He also has the strange and hitherto unknown move of turning his back on his opponent and, lets be frank about this, sticking his posterior in no uncertain manner out towards the fellow he's supposed to be fighting. Better sociologists than me can argue about the precise effect this is supposed to have; I believe it to be an enraging tactic. He probably expects the foe to see red and lose control. You have a better idea? Well then.

The aforementioned banker is gloating it up over the gold at the front of the cross-Arizona express. Before our man can get to him, though, he is temporarily distracted by a man intent on fisticuffs and a collection of single-minded capitalist running-dogs. While these are being got rid off by left hooks, high kicks and the mystery buttock-based Backsider, the train is getting up steam and leaving the station.

With one mighty bound, our hero is atop the end carriage. Fortunately for him (and others, as we shall see), there are no railway bridges on the Arizona-Paddington line. Not until Penzance, anyhow. It's also lucky that Network Out West haven't got around to electrifying this branch line.

So there are no railway-based impediments to stop him crawling along the top of the train and reaching the carriage where the banker resides. There are, however, hired hands to waylay him and put a decadent capitalist end to his brave workers fight. Bum or no bum.

The first lackey is unarmed. He can jump though, and the People's Hero has his work cut out in getting to the end of the carriage. It's no good just cutting and feinting until the opponent gets tired, as after a few seconds a bomb appears on the coupling. If it takes too long to send the bourgeois pig to his death, then all is lost.

The next evil repressor of the working man is a little better armed. He's got a box of Indian clubs, and throws them down the train with monotonous regularity. So it's run, duck, run, duck and run until the guy is within reach.

The next man has, woe, a gun. This is more tricky, but can be beaten by a true pioneer of Socialism. Remember – "Get the Gold! Kill the Banker!"

Author: US Gold
Price: £8.95

Nigel

Foreign games for the Arnold are usually rather good. Not this amateurish effort, I find it sad to say. The best part about it is the sound effects: The pictures are OK but uninspired, and the game itself is dire.

There is a certain pleasure in sticking your bottom towards the enemy, but none whatsoever in being shot repeatedly with no (apparent) chance to even get near the guy. There are three games with four levels of difficulty, but I felt no urge to explore all combinations.

12/20

Liz

"Get the gold" is your brief, so you grimly fight your way on to the express train and raid it (hence the inspired name) Naturally there are several obstacles to be overcome. It's amazing the number of people who travel on top of trains these days.

Not a spectacular game, but quite enjoyable in short bursts, and if committing the Great Train Robbery has always been one of your ambitions, and if you like kung-fu style fighting, then this game should fit the bill.

14/20

Colin

Express Raider was no great shakes as an arcade game, so you can't expect wonders from US Gold. My main criticism is that the game starts by being too difficult: The good bits are worth playing for but makes the whole program a bit of a curates egg.

For cowboy and train games I prefer Kane, from Mastertronic, written by Software Projects, it is better written and a good deal cheaper.

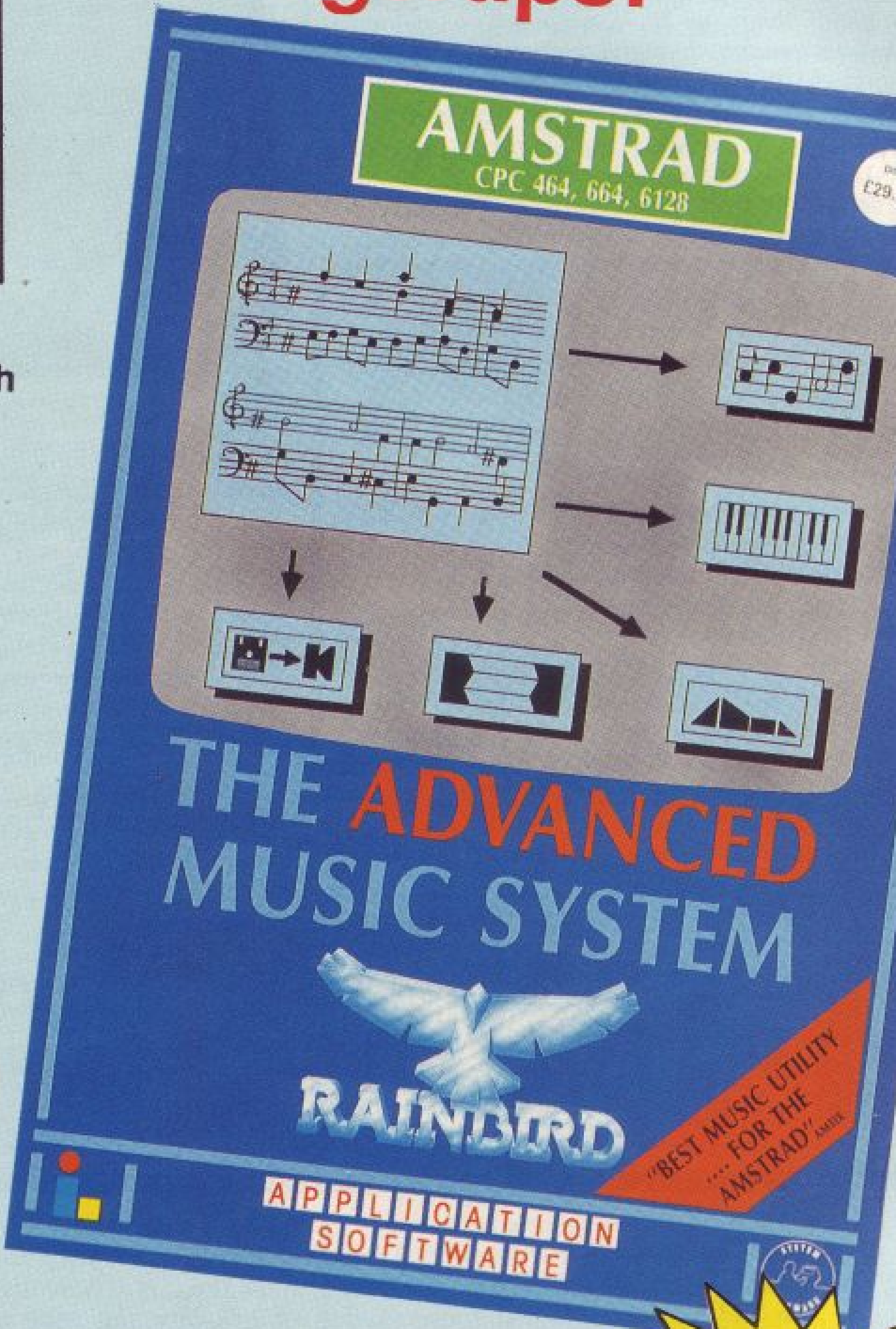
16/20

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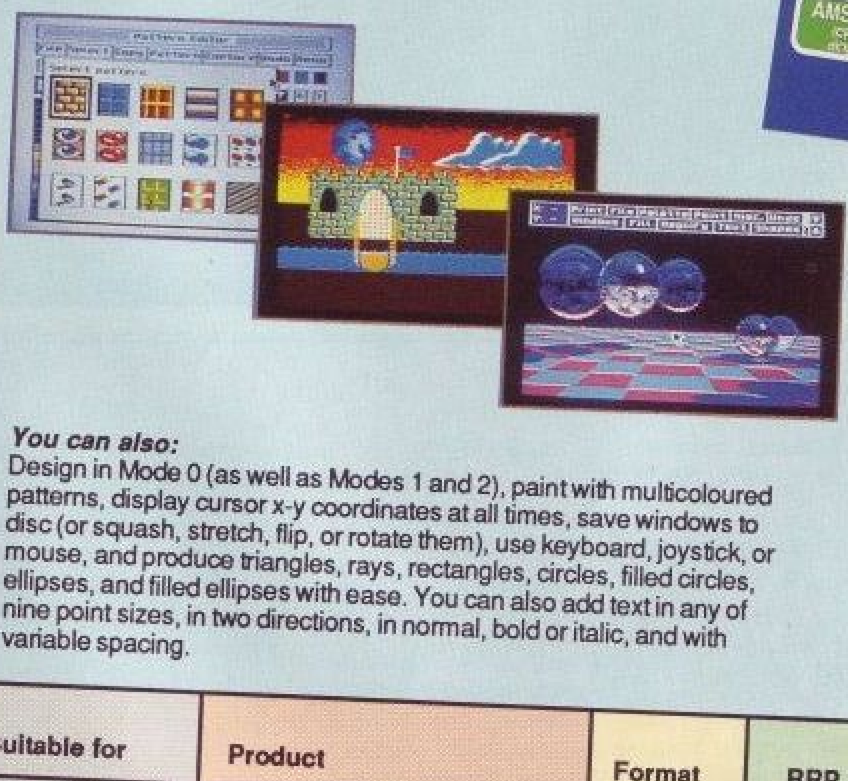
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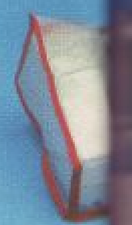
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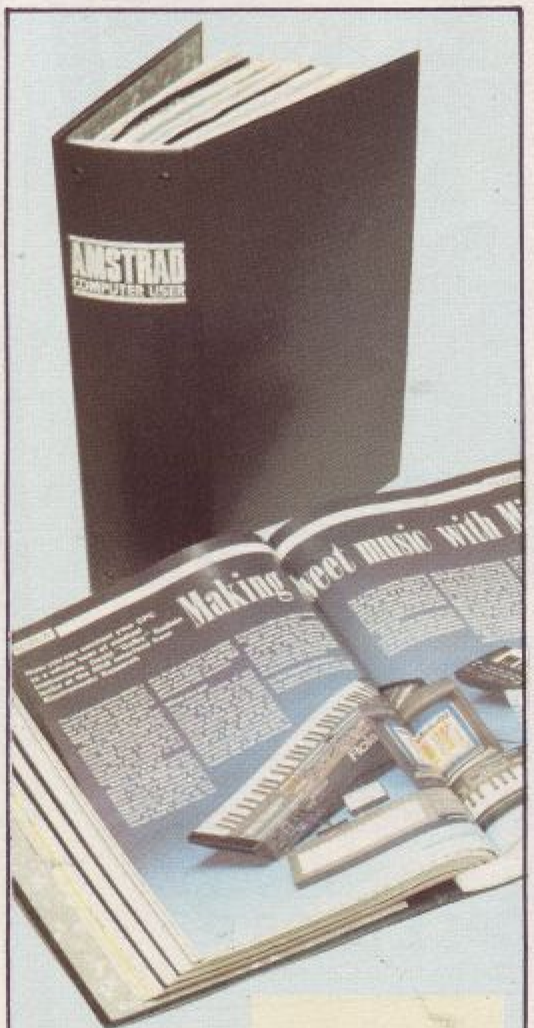
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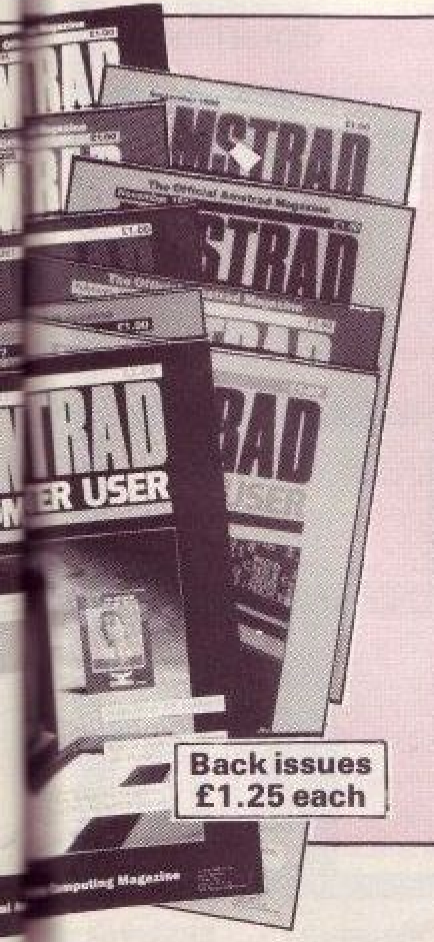
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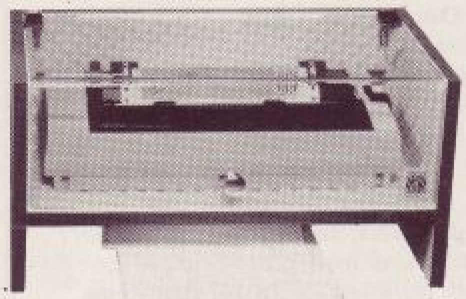
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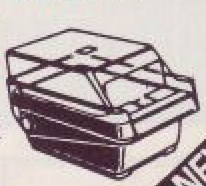
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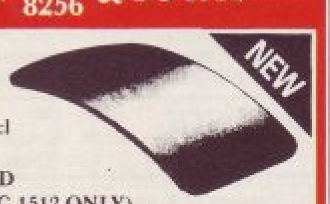
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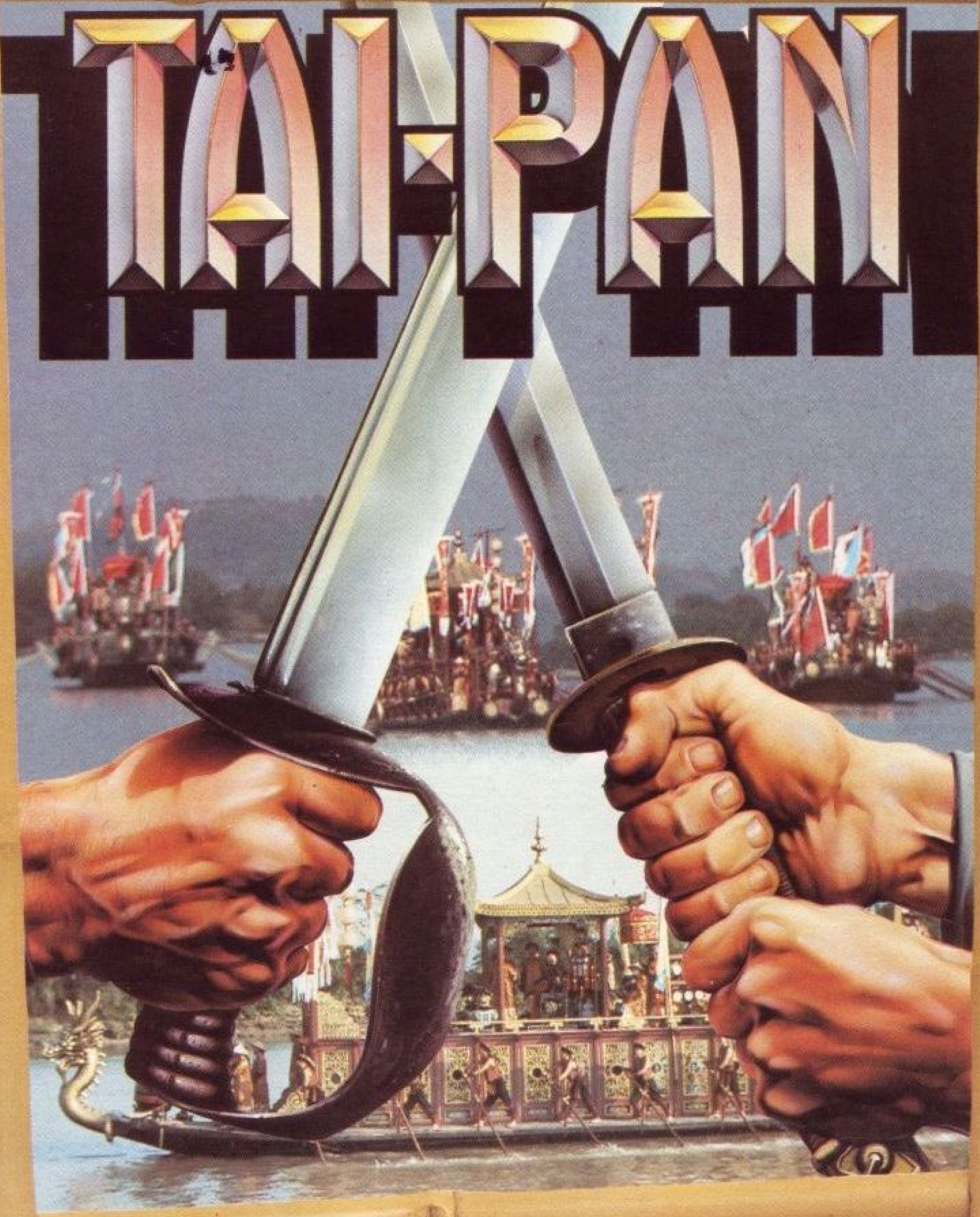
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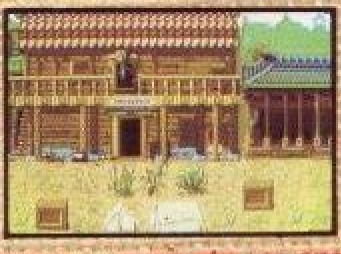
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Screen shots taken from Atari version.

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